ELECTRICAL REVIEW

ILLUSTRATED.

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Mark Twain Hears a Sermon by Telephone.

The Rev. Thomas K. Beecher, at the Park church, in Elmira, N. Y., last Sunday, preached a sermon on the life of the late Mrs. Olivia Langdon, mother of Mrs. Samuel L. Clemens, of Hartford, Conn. It was impossible for Mr. and Mrs. Clemens to be present, but their house in Hartford was connected with the church by long distance telephone, the receiver being placed on the pulpit and hidden in a bank of flowers. The line went by Syracuse, Albany and Springfield, to Hartford, a distance of 450 miles, and worked very successfully, the entire service being very plainly heard in Mr. Clemens' residence in Hartford. The same evening a number of Mr. Beecher's friends in Buffalo heard his sermon in the same way.

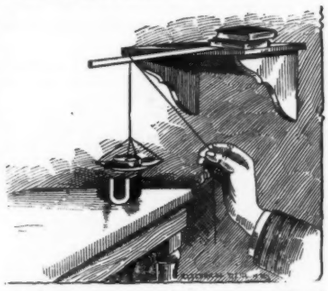
Much Excitement Caused by an Operator's Error.

Here is a good telegraph story, which, owing to the widespread interest taken in the work of the eminent Dr. Koch, will be read with interest everywhere: A short while ago, the resident doctor of the little Polish town of Pabiania received a telegram from Berlin, with the following significant words, "Koch comes immediately." No sooner had the young telegraph official spelt out these words than he left his office to take care of itself, and hurried like lightning from house to house to inform his friends and acquaintances of the great piece of news that Dr. Koch would appear in Pabiania. This news spread like wildfire through the town, and met with all the more credence as it was known that Count P—, who resided in a splendid castle near Pabiania, was suffering from a weak chest, and had interested himself greatly in Koch's discovery. It was inferred that Count P., through the mediation of the Pabiania physician, had invited Professor Koch to attend him. The clever people of Pabiania considered it a duty and an honor to give the great German man of science a worthy reception. At a meeting promptly held in one of the best restaurants in the place it was solemnly resolved to receive him at the entrance of the town and to invite him to a splendid banquet. The speech of welcome, in the temporary absence of the physician, was entrusted to the apothecary of the town for delivery in French or, if necessary, Latin. The great day arrived. In frock coats and white ties, their fur coats thrown lightly over their shoulders, the town dignitaries, under the leadership of the Burgomaster, waited on the high road for the arrival of the coach which was to bring the great man from the next railway station. At one o'clock the carriage came in sight, and in it a man with a German fur coat.

The apothecary, who had gained the necessary courage by drinking several glasses of home-made brandy, stepped courageously forward, cleared his throat, and began "H'm, monsieur, j'ai l'honneur de vous dire joli bonjour! H'm, h'm, monsieur! Dominus lupum vincit! Lupus non est in futuro!" "Merci! merci! merci!" echoed all the quality of Pabiania. Meanwhile the stranger, much frightened, drew his passport out of his pocket, and holding it under the apothecary's nose, made it plain that the new arrival was a new cook from Berlin engaged by Count P.! The notabilities crept home ashamed; each one laid the blame on the other, but the telegraph official suffered most. "Koch" means in German "cook," and the telegraphist had jumped to erroneous conclusions.

To Demagnetize a Watch.

A simple method, yet one that is said to be quite effectual for demagnetizing watches, has been devised by Mr. P. D. Richards, of West Medford, Mass., and is almost apparent from our illustration. A compound horseshoe magnet is placed conveniently with the



poles up, and over a suitable support a thread is carried, having attached at one end a cardboard scale pan holding the watch. The thread is allowed to untwist itself as the watch is slowly removed from the magnetic field. An electro-magnet would answer the purpose as well, but the permanent horseshoe magnet is within reach of every one.

The Iron and Steel Market.

The steel rail makers find it next to impossible to agree upon bottom selling prices for rails for 1891, says the *Railway Review*. Two or three companies are unwilling to lose business which they could secure if they were at liberty to name their own prices. Several meetings have been held, and a meeting intended to be final was held this week at New York, but without reaching a satisfactory conclusion. Meanwhile, a few good orders have been placed. It is probable that competition will exist, and that prices of rails will decline. Billets have recently dropped about $3.00 per ton; the latest and lowest quotations being $25.50. Some 40 furnaces have recently blown out, most of them by reason of strikes. Coke has been reduced 20 cents per ton, and strikes are threatened in some Pennsylvania coal mines and have actually occurred in others. Mills are resuming all over the country, after a brief holiday suspension. Work will begin in a short time upon eight or ten new steel works, and the steel making capacity will be considerably enlarged. Crude iron opens rather weak because of the inclination of most large buyers to postpone the making of contracts. A heavy demand for plate and structural iron will very probably set in at an early day. The extraordinary capacity of the country will probably keep prices in favor of buyers. The actual course of the iron trade for 1891 cannot be anticipated with any degree of exactness simply because it is impossible to say what percentage of the newly projected work will fall through on account of stringent financial conditions.

Explanation of a Fault Occurring in Submarine Cables.

Some time ago I had my attention directed, first by Mr. Saunders, of the Eastern Telegraph Company, and subsequently by Mr. Herbert Taylor, of Messrs. Clarke, Forde & Taylor, to a particular class of faults occurring in submarine cables, writes Mr. J. Parry Laws. The distribution of these faults is decidedly limited, occurring as they do, only in water having a moderately high mean temperature, and in positions where it is not very deep. When the core is examined, it presents strictly speaking, an appearance of simple decay, the gutta-percha having undergone some chemical change, which renders it extremely brittle and causes it to shrink in volume. I say chemical change advisedly, as there are no signs whatever of mechanical corrosion; indeed, many of these faults are taken, I am informed, from parts of the cable where the outer covering of wire remained intact; the hemp, however, at the particular spot was entirely destroyed. These faults have, therefore, caused considerable speculation as to their origin, and the explanation I am about to suggest seems to me, on due consideration, to be at least feasible.

Taking into consideration the high temperature of the water, and the very limited position of these faults, I have come to the conclusion that they may probably be produced by the action of putrefying organic material either in actual contact with the cable or in close proximity to it. Guided by this hypothesis, I made some experiments on a laboratory scale to determine whether organisms, such as occur in putrefying fluids, or the products of their life, would have any effect on the core of submarine cables. The few experiments I have made show conclusively that putrefaction does exert a very marked effect upon gutta-percha, some classes of putrefaction producing more effect than others. The few experiments I have been able to carry out are certainly confirmatory of the above suggestion, the gutta-percha being considerably eroded and pitted after remaining in a putrid fluid for some time.

I hope to make experiments in greater detail, and publish the above as a mere suggestion, in the hope that others may collect facts tending to establish or disprove it.

The Nationalists and Municipal Control.

The Nationalists are making an effort to secure an enactment of law by the Massachusetts legislature permitting towns and cities in the commonwealth to sell gas and electric light to the citizens. This is hoped to be a first step toward a realization of Bellamy's Utopian dream. If these scientific enthusiasts could be persuaded to band themselves together and carry out their revolutionary ideas on some Pacific island they would not only receive convincing proof of the impracticability of their political notions, but would spare the United States much annoyance. It has been repeatedly and convincingly demonstrated that private competition can be relied upon to do better and cheaper work than municipal management. One watches with a careful eye every step of the management of its concerns; the other is invariably accompanied in the long run by mismanagement and jobbery. What is everybody's business becomes nobody's business and the poor tax payer always suffers. There is enough corruption, forsooth, in political affairs in the present scope of governmental functions, without taking dangerous chances on an expansion of the field of operation. The less the State interferes with private affairs the better for the public.

Not Very Encouraging, but We Hope for a Change of Mind.

The attitude which will in all probability be adopted by the majority of European electrical firms in regard to the Chicago Exhibition, is that of the gentleman connected with the Allgemeine Elektricitäts Gesellshaft, who, according to the article in our Chicago contemporary, displayed "the most profound and startling indifference to the World's Fair and the electrical department." His company, he said, would make an extensive exhibit at the electrical exhibition at Frankfort-on-the-Main, but, *horrible dictu*, "as for Chicago, he knew nothing about its Fair, and he cared less." This, says our contemporary, "was an expression of opinion from a foreigner who had visited the country several times, could speak its language, and, what is still more important, he had quite a large sum of money invested in electrical industries in the United States." Sentiment has but a small place in business affairs, and yet it would be little else than sentiment for a European firm to send its wares several thousand miles across the sea to such an electrically self-sufficient country as the United States of America.—*London Electrician.*

Improvements in the Edison-Lalande Batteries.

The Edison Manufacturing Company have recently made some valuable improvements in all types of the Edison-Lalande battery by the addition of hollow hard rubber insulators. These are placed on the sides of the

IMPROVED EDISON-LALANDE BATTERY.

copper frames holding the oxide plates, thereby preventing short circuiting at the line of the solution.

By this means the efficiency of the battery is greatly increased, as the zincs are not attacked in the least at the water line. In the "K" cell they have substituted a narrower frame holding smaller and thinner oxide plates, which are exhausted at the end of the first charge, together with the zincs and potash solution. These various improvements have enabled the Edison Manufacturing Company to reduce prices on the "K" cell, which is meeting with the great success it merits.

Experiment With a Condenser.

COMMUNICATION OF SIR WM. THOMSON TO THE LONDON "ELECTRICIAN."

Sir, on the day after our last meeting of the Physical Society, I saw, at Deptford, in a test by Mr. Ferranti of a vulcanite tray subjected to 20,000 volts (square root of mean square), a most interesting illustration of one of the subjects discussed in connection with Mr. Swinburne's paper. The tray was rectangular, with rounded corners and edges, and may have been eight or ten inches long, by five or six inches broad, and one and a half inches deep (I write from memory). The vertical sides ended in a flat lip, about one inch broad, projecting horizontally on all sides. It was laid on the bottom of a large metal tray filled with water, and was filled up inside to a depth of about half an inch. During the test we observed a blue line of light all round the water-lines both inside and outside, which seemed to be everywhere about a quarter of an inch broad (we did not apply a ruler or compasses to measure it). When the test was completed and the electrification stopped, we took the tray out and looked at it carefully all round. We found, as we expected, that there was no sign of perforation, but we saw a very remarkable appearance all along the lines, inside and outside, which had been the boundaries of the water. They showed, at regular intervals, little vertical marks, the explanation of which was, no doubt, capillary standing waves produced in the water by the electric force, and analogous in hydro-kinetic and capillary quality to the ripples seen inside a finger-glass caused to sound by a wetted finger drawn along its rim. The blue light which we saw was, of course, due to the same cause as the well known sparkling at the edges of the coatings of a Leyden jar when suddenly charged or discharged. The sparkling described by Mr. Swinburne in his mica condenser was, no doubt, due to the same cause. When the breadth of a band of sparking round the edge of a metallic coating is considerable in comparison with the linear dimensions of the coating in any condenser subjected to rapidly alternating high potential, there must be considerable heating due to it; and the mere fact of heating would not prove that any sensible proportion of the heating is due to viscosity of electrostatic inductive capacity.

An internal sparkling or quasi-sparkling in some of the ingredients of heterogeneous insulators may be the cause of some of the heating of condensers which has been observed by Mr. Swinburne and others.

Recurring to the subject of duration of contact between two mutually impinging metal balls, we must not assume that this is the duration of electric conductance between them. On the contrary, when the potential of the charge is several thousand volts, there might be separation to the extent of a millimetre or two without cessation of very effective electric conductance. But it will be interesting to find, whether, with charges of one or two volts, the exceeding shortness of the duration of metallic contact of mutually impinging balls can suffice to let us sometimes find the electrification of a condenser reversed, after a discharge by impact, even in cases in which the period of the oscillatory discharge with constant resistance is only a few ten-thousandths of a second.

Peculiarity of Magnetized Steel Plates.

Some experiments made on the magnetization of thin plates of steel by W. Doule indicated that the line of magnetization is a diagonal to the axis. In all cases tried the magnetization at right angles to the plane of the disks seemed to be impossible. Two poles always appeared arranged as if the magnetizing force had acted along a diagonal in the case of squares, and parallel with the longer side in the case of the rectangles. A series of steel cylinders, made variously of Bessemer, tool and manganese steel of varying lengths, showed a perfectly defined magnetization in the direction of their axes when the length was 10 millimetres or more. As the length was reduced, the polar axis became more and more inclined to the geometrical one, until, at a thickness of one millimetre, the same state of affairs was observed as with thin square plates. Of the latter, 80 plates, 0.25 millimetre thick and 10 millimetres to each side, were placed together and magnetized. So long as they remained together a regular distribution of magnetism existed; when separated, however, the plates indicated magnetism along the diagonal.

BOOK NOTICES.

The Philadelphia *Record* has sent us its annual almanac. It is rich in Pennsylvania political information and other statistics of value.

The St. John, N. B., *Evening Gazette* sends us a New Year's souvenir. It is a little booklet containing an appropriate poem called "The New Year," by Clare Everest.

The Cincinnati *Commercial Gazette* is sending out a pocket memorandum diary for 1891. Besides containing much valuable statistical matter, some new and true advertising maxims and testimony are given. The *Commercial Gazette* is nothing if not enterprising.

The *School Bell*, is the title of an eight page monthly paper, issued by the pupils of Public School, No. 3, at Arlington, New Jersey. The December issue is "Vol. 1, No. 1," and is before us as we write. For a first number it is a good one, especially when it is known that the editor is Ernest P. Fredericks, a young man, 15 years of age.

In an article headed "Journalism," Editor Fredericks expresses views which show him to have discernment and good judgment.

The article reads in part, as follows:

"The New York *Sun*, is one of the best written papers in the United States, and contains the bright ideas of such men as Charles A. Dana and Amos J. Cummings, who are without a parallel, and whose work must be considered as journalism in the full sense of the word: whose every line contains a new thought and whose language is metered out in perfect proportions. * * * * * We have entered upon the journalistic field in a sense, and still, while we may not make a dust in the world, because of our bright and unparalleled accomplishments, the *School Bell* at least will maintain the right to be called a newspaper by its containing such matter as will be interesting to the public in general."

Another bright member of the *School Bell* staff is F. E. Suderly, aged 16 years. He contributes an article entitled "Electricity and Its Uses," which we reproduce in full:

"When steam was first known as a motive power the people of that day had no idea that steam would be replaced by electricity, but such a short time has intervened between the first time a steam locomotive was used and now, that many people who saw the first steam locomotive may see the first electric one.

"It has been said that steam is the originator of electricity. In one way it is, but we do not depend upon steam for all the electricity that is used. If we did, how many houses having electric bells and burglar alarms would have them? Do you suppose anybody is going to have a great puffing steam engine and dirty greasy dynamo in their house for a bell, when all that is necessary is a little glass jar, which can be put in some corner out of sight, and which causes no dirt, takes up no room, yet does all the work required, with none of the objections to an engine or dynamo? So those who claim that steam was the originator of all electricity are, in my opinion, in the wrong.

"It was not so very long ago when the horse cars were in full sway, and are so still in some of the *slow* cities in this country. They were first displaced by the cable cars, and these did very well until electric cars were run. The electric cars are among the greatest improvements of the age, for they not only do away with much cruelty to horses, which was so noticeable in all cities, but also do away with the slowness of travel.

"There are two kinds of electric systems for propelling cars. One in which the electric current generated by dynamos at a distant station is carried by means of overhead or underground wires to the motor on the car; the other in which the motor derives its current from a storage battery carried on the car.

"It is probable that all the readers of this paper understand both of these systems, so I will not take time and room in explaining them, but I will say that the overhead system is used mostly on streets having long or steep hills, such as the Newark and Irvington Road, Central Avenue and Bloomfield lines in Newark, while the storage system is used mostly on streets where there are no hills, as in Fourth Avenue, New York and Prospect Avenue, Newark. The storage system is the most pleasing to look at for there are no great poles sticking up in the middle of the road; and the car glides along with no power visible.

"We must not confine ourselves to street cars for there is the electric locomotive, invented by Prof. Marks who says it will run from Newark to Philadelphia in 36 minutes, the ordinary locomotive time being about 2½ hours. Then we have the electric bell. What an improvement on the old brass knocker of 100 years ago! Then the burglar alarm which thousands of people depend upon for the safety of their households. Of course a dog does very well, but a dog can be poisoned or carried off a day or two before the attack is made, but the alarm cannot be carried off.

"We also have the electric light, which is of two kinds, the incandescent, used mostly in lighting dwellings, stores and factories, and the arc light for street illumination.

"Electricity is also used for telephones, telegraphs, phonographs, and many things which are common to us all, while the electric motor for light work, such as running sewing machines, fans and small mechanical apparatus, is rapidly supplanting the steam engine.

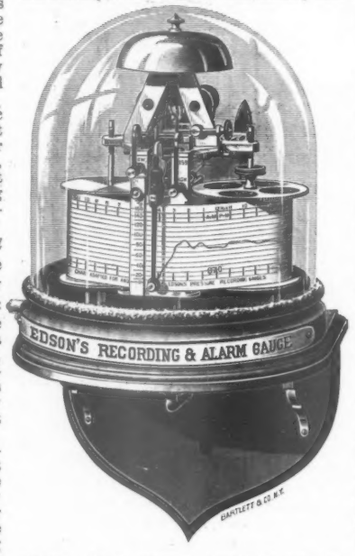
"Electricity is used also for medical as well as mechanical purposes. Dr. Ringer, a noted physician in the city of New York, uses it almost entirely for rheumatism and it gives general satisfaction.

"From the above facts, although not elaborate, you may see a few of the principal uses of electricity which is the coming motive power of the world."

We wish the new journal and its staff every success.

Improved Pressure Recorder.

We illustrate a new form of pressure recorder, just produced by Mr. Jarvis B. Edson, of this city, whose instruments for this purpose have long been recognized as the standard ones, both in this country and



abroad. In it extreme simplicity and increased efficiency have been secured—the natural result of a long experience in this line of manufacture, coupled with an enthusiastic appreciation of the rapidly dawning recognition of the economic value and safety of pressure recording gauges.

London Underground Electric Railway.

The heavy snow in London during the last week, says the London *Electrical Engineer*, has sorely tried the omnibus and tramcar horses, who were slipping about in all directions. It has been prosperous times for the South of London Electric Railway, which, starting just as the snow came on, has received much of the patronage that otherwise would have gone to the 'buses. The dangerous state of the roads, moreover, has induced the 'bus conductors to put up the prices to sixpence, and the invariable price of twopence at the electric railway turnstile is, therefore, a still further inducement to the public.

Strike on the Edison Building.

About 200 workmen employed in the construction of the Edison General Electric Company's new building on Broad street, this city, were ordered to strike by the Board of Walking Delegates last week. The Board of Walking Delegates had been considering the advisability of calling out the workmen on the building, not because of any specific grievance, but to forestall a move on the part of Contractor Fitzpatrick, who intended to bring in a lot of boycotted marble as soon as the building reached the proper stage of completion.

VIEWS, NEWS AND INTERVIEWS.

A recent reduction in the price of Lake copper ought to make wire cheaper—theoretically speaking.

Platinum is selling for $16 an ounce. The market is easier now than it has been for some time. It is doubtful if the price goes any lower.

At an autograph sale in Boston the other day, a letter on agricultural and scientific topics, by Benjamin Franklin, brought $50, the highest price paid for any one in the collection. A list of signatures in which Franklin's name occurred twice brought $15, and an imperfect letter of his was sold for $12.

A story about Commissioner Hess, of the Board of Electrical Control, has been given currency by the daily papers. It seems that Mr. Hess and the late Daniel E. Gibbens, who was also an electrical commissioner, were drinking champagne together one day. Mr. Hess, seeing the word "Sec" on the label, said:

"Dan, what does that word stand for?"

"For dry," responded Mr. Gibbens.

"That settles it," said Mr. Hess. "My cards shall hereafter read: 'Jacob Hess, Sec.'"

A reader of the ELECTRICAL REVIEW thinks there is deep significance in the fact that the number of cable roads in the United States remains at "44," while the number of electric roads keeps growing in steady progression.

A good story was told at the Electric Club the other night, about Dr. Lugo, an inventor in the early days of '80.

"Amereeka is a ver' funny countree," remarked the doctor, on one occasion. "I do not unnerstan' it. I see the stock of the Lugo Electric Company quoted at 200. I have my pockets full of it and yet I am hungree!"

"I am both surprised and gratified at the feeling which now exists between men connected with rival electrical interests," said an old-timer. "In the early days bare civility was the most that could be expected from an opponent, and even this was not always vouchsafed. Nowadays, while competition is just as keen, if not more so, there is a feeling of fraternity which prevades the whole industry, and makes us old chaps glad."

There are over 100 nickel-in-the-slot automatic phonographs standing in public places. The demand for them is in excess of the manufacturing capacity of the factory where they are made. They receive the attention of an expert every day. He looks after the mechanical and electrical parts, oils them up and changes the cylinders—and collects the nickels.

It is reported that some enthusiastic admirers of Sir William Thomson in Scotland are getting up a testimonial congratulating him on receiving the honor of being president of the Royal Society. Perhaps their enthusiasm would be more to the point if they congratulated the Royal Society on the honor of having Sir William Thomson as president.—*Industries.*

Telephone Territorial Consolidation.

Atlanta is now headquarters of the Bell Telephone Company, for all of Georgia, South Carolina, Florida and Alabama. In the South, the Bell Telephone Company has had three districts since the introduction of the system. Now it has only two, the reduction commencing January 1st. We have received the following official circular:

To all concerned.—The territory formerly constituting the second and third districts of this company, embracing the states of South Carolina, Georgia, Florida and Alabama, having been consolidated under one management, with headquarters at Atlanta, Ga., all private line subscribers and other interested parties within this territory are requested to note the change. Very respectfully.

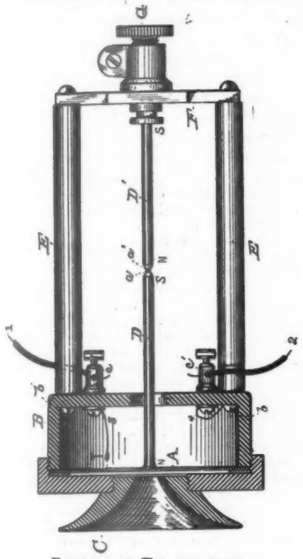
John D. Easterlin, Supt.

Atlanta, Ga., Jan. 1st, 1891.

PROGRESSIVE ELECTRICAL INVENTIONS.

TELEPHONE TRANSMITTER.

A novel form of telephone transmitter has been developed by Sigmund Bergmann, of New York, which we herewith illustrate. The characteristic feature of the device is dispensing with carbon contacts and bringing two steel electrodes tipped with platinum, marked D D^1 in the engraving, into direct contact. One of these electrodes is secured to the central point of the diaphragm, which may be of mica or any other elastic material, and the other is mounted in the frame and rendered adjustable by means of a thumb-screw G. The bars D D^1 are thus maintained in contact and prevented from any

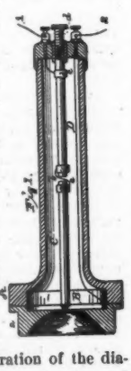


BERGMANN TRANSMITTER.

absolute separation. The bars are given sufficient weight to add inertia enough to prevent an absolute separation. In order to further increase this action, they are preferably magnetized so that they tend normally to remain in close and firm contact. The sound waves impinging on the diaphragm cause a variation of contact, creating a change of resistance in the circuit, of which the wires 1 and 2 are terminals, passing from wire 1 to the diaphragm if of metal, or to the bar D if the diaphragm be of mica, thence through the other electrode B^1, metallic support E, and binding screw c^1.

TELEPHONE RECEIVER.

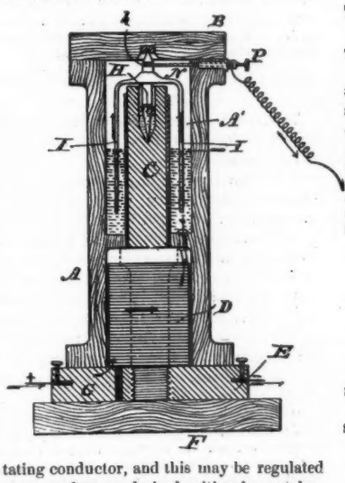
Mr. Bergmann has also developed a novel form of telephone receiver. It consists of two bar-magnets placed end to end. In the accompanying engraving two bar-magnets are shown placed end to end, one of which is fixed to the frame of the telephone and the other to the diaphragm. When the current is caused to pass through the bar-magnets, the diaphragm is actuated in proportion to the strength of the current. The theory advanced by the inventor in support of this operation is that the molecules of the magnet tend to set themselves at right angles to the flowing current, and that this results in a diminution of the magnetism, thus causing a variation which develops vibration of the diaphragm under the influence of a rise and fall of current. A large number of instruments in which this peculiar action may be carried into operative effect have been disclosed by Mr. Bergmann, in some of which the current passes over a single magnet, which thus acts with a varying force on the co-operating diaphragm or flows through a magnet, the poles of which are brought into close juxtaposition, one pole being



fixed and the other connected to the diaphragm; in another case, the current passes through a steel coil spring having one end fixed to the frame and the other to the diaphragm. In all these cases the same tendency is created by the passage of a current through the magnets.

ELECTRIC METER.

A great number and variety of electric meters have been developed by inventive electricians. The latest type of instrument has been designed by Camille A. Faure, one of the pioneers of the modern storage battery. One form of instrument designed by Mr. Faure in carrying out his idea is illustrated in the accompanying engraving. Advantage is taken of the property of a conductor carrying an electric current to rotate in a magnetic field. Such a conductor I, is pivotally supported on an iron core C, having depending extensions dipping in a reservoir of mercury. The framework of the instrument is composed of non-magnetic and non-conducting material. The iron core C forms an extension of the core of an electro-magnet mounted at the base of the instrument. The instrument is interposed in the electric circuit of which the current is to be measured, the current entering at the positive terminal, passing through the coil D, thence through a conducting plug to the body of mercury, thence through both arms of the conductor I to the core C, and from there to a metallic base E, with which the core is in contact, and out to the other side of the circuit. The extension C of the magnetic core is sheathed in insulating material. The current thus not only creates a magnetic field, but passes in transit through the instrument over the pivoted conductor I, conditions which insure a rotary tendency of this conductor. The mercury acts as a damper to retard the rapidity of movement of the ro-



tating conductor, and this may be regulated more or less as desired, either by amalgamating the mercury to a thicker consistency than pure mercury, or by inserting mechanical vanes to retard the circulation. The spindle of the rotating wire I may impart its motion directly to a register, by means of a train of wheel work, or may periodically interrupt a local circuit through the wire P, by forming one contact at each revolution with a spring N, this local circuit including any desired form of electro-magnetic registering mechanism. The moving force upon the rotating conductor is proportional to the square of the current, but inasmuch as the force required to move any object through a liquid is proportional to the square of the speed, it follows that the number of rotations of the conductor will be proportional to the current to be measured. The instrument may be converted into an ampere-meter by extending the axis of the rotating conductor and mounting an indicating needle thereon maintained at zero position by the tension of a light spring.

DESILVERIZING LEAD BY ELECTROLYSIS.

The electrolytic reactions of a current, although one of the earliest discovered properties, has not met with as wide an application as the electro-magnetic properties. A recent departure in this field has been proposed by Mr. Turner D. Bottome, of Hoosick, N. Y., the object being to completely desilverize lead and obtain pure silver in a solid metallic form ready for the market. For refining lead containing only a small quantity of silver the usual process is to melt the lead and then allow it to cool until crystals of lead form. These crystals are removed and the molten liquid remaining contains a greater part of the silver. It is then cupelled in the ordinary way to obtain the silver in the free state. Mr. Bottome proceeds by mixing one-quarter of a pound of ammonium nitrate and the same quantity of ammonium carbonate in a gallon of water, thus forming a solution that will precipitate lead and yet dissolve silver in the presence of carbon di-oxide. In this solution pigs of lead are immersed as anodes, any suitable conductor forming the cathode, and a current is passed through the solution, the lead and silver both going into solution, but the lead is immediately precipitated by the presence of free carbon di-oxide, which is continually injected into the bath during the working of the process. The silver instead of being precipitated is deposited in a metallic state upon the cathode.

A Prominent Engine Man Recalls an Incident of '64.

TO THE EDITOR OF ELECTRICAL REVIEW:

While serving an apprenticeship to the machinist trade at the locomotive works of N. Y. C. & H. R. R. R., West Albany, N. Y., I recall the breaking of walking beam on large stationary engine which necessitated the use of a temporary engine. It was supplied with steam from a locomotive taken from freight train service and placed in upper end of machine shop. This was during the winter of 1864 and 1865. Your reference to similar occurrences requiring steam power, at Schenectady and West Chester, Pa., recalls the incident.

Very truly yours,

GARDINER C. SIMS.

Providence, R. I., Jan. 8th, 1891.

To Exhibitors at the Providence Electric Light Convention.

TO THE EDITOR OF ELECTRICAL REVIEW:

Please announce in your next issue that all parties desirous of exhibiting in the hall secured by the National Electric Light Association, at Providence, R. I., on the 17th, 18th and 19th of February next, must send in their application at once, as the allotment of space will soon begin. The applications already sent in aggregate nearly all the available space in the hall, and it may be necessary to cut down the applications *pro rata*.

Yours truly,

C. H. BARNEY,

Chairman Committee on Exhibits.

New York, January 8th, 1891.

The Latest Figures.

Whipple's Reports for January, 1891, furnish us with the following information:

CENTRAL STATION COMPANIES.

Stations in United States	1,543
" Canada	120
" Cuba	1
" Mexico	10
Total Stations	1,674

GAS COMPANIES.

Companies in United States	974
" Canada	49
" Mexico	1
Total	1,024
Companies operating Electric Lights, U. S.	280
" " " " Canada	20
" " " " Mexico	1
Total	301

STREET RAILWAY COMPANIES.

Companies in United States	911
" Canada	24
Total	935
Electric Roads in Operation and under Contract in United States	281
Electric Roads in Operation and under Contract in Canada	6
Total	287
Cable Roads in the United States	44

An English Long-Lived Lamp.

Mr. J. Lavender, Jr., writes the London *Electrician* as follows: "*Re* long-lived lamp mentioned in your correspondence column of August 29th last. This lamp was removed from its holder on Thursday last, having done duty for 11,561¾ hours. The filament is unbroken. As stated in previous letter, it is an Edison-Swan lamp, 100 volt, 16 candle-power type. Total power in watts consumed prior to removal was 16.6. No photometrical measurement was taken. We have another lamp of the same type, with record of 11,361 hours to Thurday last."

Des Moines, Ia.—National Railway Electric Signal Company; capital, $1,500,000.

Wilmington, Ill.—Wilmington Electric Light and Power Company; capital, $21,000; to furnish electric light and power; incorporators, Descre J. Courval, J. H. Campbell, J. H. Ray.

Carondelet, Mo.—The Carondelet Electric Light and Power Company, with $100,000 capital stock. The stockholders are, John Krauss, Robert J. Kilpatrick, Wm. H. Hallett and O. A Haynes.

Carthage, Mo.—The Carthage & Twin Citys Electric Railway and Power Company; capital, $150,000. The incorporators are, Maj. W. B. Myers, Maj. H. H. Harding, C. O. Harrington, Joseph Herrin, G. D. Sleeper, C. N. Reynolds and Albert Cahn.

Danville, Ill.—Danville Gas, Electric Light and Street Railway Company; capital, $250,000. To furnish gas, steam and electricity, and to build and operate a street railroad. Incorporators, Andrew C. Daniel, Frank W. Penwell and William P. Cannon.

Detroit, Mich.—The Fontaine Crossing Company; to manufacture a patent railway crossing and electrical machinery, with a capital stock of $75,000. The stockholders are Frank E. Kirby and Neil McMillan individually, and as trustees, E. J. Owen, E. I. Parkinson, of Detroit, and J. H. Peurud-dock, of Port Huron.

The Westinghouse Company's New Stock.

THE PLAN PROPOSED FOR THE ISSUANCE OF THE PREFERRED ELECTRIC STOCK.

At a meeting of the board of directors of the Westinghouse Electric Company, held January 6th, 1891, the following statement was prepared:

OFFICE OF WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY.
PITTSBURGH, PA., Jan. 6th, 1891.

DEAR SIR:—The directors and stockholders of this company, by appropriate action, authorized the issue of the stock of the company to the limit now fixed, to wit, $10,000,000, the unissued portion thereof, to the amount of $3,000,000, to be issued as preferred stock with the following form of preference:

This stock is a preferred stock, and is to be and remain a first claim upon the property of the corporation after its indebtedness, and the holders thereof shall be entitled to receive from the net earnings of the company a dividend of six per cent. per annum, payable semi-annually on the first days of July and January, before any payment of dividend upon the common stock; and said dividends on said preferred shares shall be cumulative, that is to say, in case any dividends due on said preferred shares are not paid, all such unpaid dividends shall be paid in full before any dividends shall be declared and paid on the common stock. After the common stock shall in any one year receive a dividend of six per cent., any further dividends declared that year shall be declared on all the stock, common and preferred, share and share alike.

In pursuance of the above action, the board of directors have adopted the following resolution:

Resolved, That the stockholders of the company be requested to subscribe for the preferred stock (to the extent of, at least, one share for every two shares of common stock now held by them, respectively), and that they shall have the option of either of the following terms of payment:

First—Ten dollars per share on the 25th of January, and $10 per share on the 25th of each month thereafter, until the total of $50 a share has been paid; or,

Second—Twenty-five dollars in cash and the surrender of one share of common stock to the treasury of the company on or before the 25th day of January, 1891, in full payment for each share of preferred stock subscribed for.

That subscriptions be received upon the same terms from any who are not now stockholders, for any of the residue of this preferred stock that the stockholdres may not take.

Payments on subscriptions to be refunded if a total of 20,000 shares of preferred stock be not subscribed for.

Enclosed herewith are subscription forms covering the two methods of payment. You are requested to make a prompt reply to this communication. Respectfully,

GEO. WESTINGHOUSE, JR.,
President

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No attention will be paid to communications for the REVIEW without the *name and address of the writer.*

NEW YORK, JAN. 17, 1891.

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Rumors of electrical consolidations are again circulating around. Our friends of the daily press find a great deal of interest in electrical circles these days.

A New York daily blamed electric wires for the Fifth Avenue Theatre fire. Of course. However, all investigation went to prove that it was the deadly cigarette—and not the "deadly" wires.

The convention of the National Electric Light Association, to be held at Providence, R. I., February 17th, 18th and 19th, promises to be largely attended and will undoubtedly be an important meeting. There will be a large attendance of the associate members, many of whom have arranged for interesting exhibits. All the active members are urged to be present and assist in making the Providence meeting a pronounced success.

It is stated that the establishment of the telephonic cable between London and Paris is progressing satisfactorily. The cable portion will be 24 miles long, and will be laid under the direction of the post office authorities.

Vice-president Morton, as presiding officer of the U. S. Senate, rules that an appeal from the decision of the chair is debatable. He has evidently never heard of the Niagara Falls meeting of the Electric Light Association.

The adoption of electric search and arc lights on the steamers of the great lakes is meeting with favor. "The general adoption of these lights on lake tonnage is only a question of time," says the *Marine Record*, "as wherever they have been fitted the best results in getting through the rivers, loading and discharging their cargoes and otherwise facilitating the movements of the vessel has been found to obtain."

The Fire Marshal of New York has expressed his belief that the fire at the Fifth Avenue Theatre was caused by a lighted match or half-burned cigarette. This opinion is of an official nature and carries weight. It is claimed that the report of the fire being caused by electric wires was started by those who wished to conceal the fact that smoking was indulged in by the actors in their dressing rooms during waits.

Mr. Charles Ffrench, our European correspondent, whose comprehensive and interesting London letters appear in the REVIEW, will hereafter make his headquarters at the Hotel Victoria, the most popular hotel in the city for American travellers. Mr. Ffrench will gladly meet all of the REVIEW'S friends who visit London. His address is given in full in our "Announcement" column. We are pleased to state that through Mr. French's efforts the REVIEW'S list of readers in London and on the Continent has materially increased during the past year.

ELECTRICITY ON THE ELEVATED ROADS.

The New York *Sun* in discussing the rapid transit problem for New York city pertinently remarks.

"Another point in connection with the elevated system, upon which the recommendations of the Rapid Transit Commission would have great weight, would be the procuring of some enactment compelling the use of electricity upon the elevated railroads in place of steam power. The substitution of a steamless, sparkless, smokeless and comparatively noiseless system of traction for the present locomotives is thoroughly practicable and should not be much longer denied to the citizens of New York.

"The very nature of the structures makes it a matter of the greatest ease to apply the current without the slightest danger to life or property. That electricity is not already used on these roads is, in the present condition of electric science, nothing short of a public reproach."

As usual, the *Sun* strikes the nail squarely on the head. The time must come and soon when steam will be relegated to a condition of innocuous desuetude as a motive power for rapid transit. Whether the ultimate solution of the problem in New York city be by way of an overhead or underground wire, electricity is pre-eminently the agent which offers the greatest advantages. Surface transit is not practicable for long distances, as the dangers to life and limb of the high speeds absolutely necessary in a large metropolitan city will preclude a possibility of successful results in this direction. The present elevated structures admit of ready adaptation to electricity; high speeds may safely be attained; the cars may be run close together and danger to pedestrians from broken or fallen wires is absent. Electrical engineering is fully equal to the task of equipping the elevated system with an electrically operated plant. The present elevated system will, however, be inadequate to meet the requirements of New York city in the future, and any attempt to spread the unsightly structure over other streets will doubtless meet with determined and deserved resistance. An underground railway is a reasonable certainty of the proximate future, and the experience of London with steam and its concomitants of smoke and noxious gases, points to electricity as the motive power. With the great advantages of pure air, splendid lighting and high speed possible in an underground electric railway, a tunnel ride would be a journey of pleasure.

ON MATTERS TELEPHONIC.

There is no branch of the electrical industries about which the majority of technical journals are less qualified to speak with authority, or even with reasonable knowledge of what they are talking about, than telephony. It may be safely said the entire press, lay and technical, is moved, when writing on subjects connected with the telephone, by a plentiful fund of misinformation which is something appalling.

We have called attention to the errors of the daily press in connection with the wonderful literary productions that are now known throughout the scientific world by the derisive term of "newspaper science." It is, therefore, with no great surprise, that we note a leading New York daily inveighing against the high rates charged for telephone service in New York, and citing, in galling comparison, the cheap rentals charged by the German government telephone administration in Berlin. When, however, we find practically the same matter, written up in slightly different shape, but from the same ignorant standpoint, in the editorial columns of a contemporary which boasts of being the pioneer electrical journal in America, we think it high time to call a halt and to review the subject under discussion in a more intelligent manner.

We have, on several occasions during the past few months, called attention to the progressive work that is being carried on by the telephone company in this city and to the improvement effected in the service thereby. This wholesale construction of new offices equipped with entirely new and improved plant, and the interlacing of the entire city with underground cables of costly manufacture, can only be prosecuted at enormous expense, and can only result in more efficient service; the improvement in the service has been very noticeable during the past year or so, and we are certain that New Yorkers have no solid grounds for complaint on this score.

As to the difference in the cost of service between New York and Berlin there can be no possible comparison. It would be as reasonable to complain of the difference in the cost of living in the two cities. Everybody knows that New York is about the most expensive city in the world to live in, and the cost of any commodity, whether it be telephone service or house rent, is bound to be in relation to the average cost of commodities in general. Then, again, to compare a service furnished by a commercial organization to that provided by a government administration is absurd in the extreme. Government administrations have innumerable advantages that are denied to companies, and get for nothing what companies have to pay for liberally. It is well known that various European governments run their telegraph and telephone departments at a loss, for reasons that it is not necessary to specify here; but because they do this is it to be expected that American capitalists shall furnish the money for providing their fellow-countrymen with commodities at less than cost price?

In the special case cited, it must also be remembered that the Berlin telephone circuit is entirely on a ground circuit basis. There are no metallic circuits, and the service is far inferior to that provided in New York. Berlin subscribers cannot use their telephones to speak over long distance lines, but have to proceed to a pay station. In New York any metallic circuit subscriber can speak direct to another subscriber in any of the cities connected by the long distance system.

Even the actual figures given in our contemporary are incorrect. The rate for five minutes' conversation between New York and Boston is $2 and not $2.50, and the contrast between this and 50 cents per message between Berlin and Bremen is not so very sharp after all, for the reason that the 50 cent message can contain only a limited number of words and may be spoken over the wire in less than a minute. It would, therefore, take perhaps a dozen messages to equal five minutes' steady conversation.

By a curious coincidence, we find that our sprightly and effervescent contemporary, the London *Electrical Review*, in its issue to hand this week, contains an editorial on telephony which shows conclusively that the writer has yet much to learn on the subject. It is stated that a telephone line 400 miles long would require a copper wire weighing not less than 400 pounds (and probably 600 pounds) to the mile, and doubts are entertained as to the commercial success of such a line.

Perhaps it will surprise the learned editors of our English contemporary to know that a line built of wire one-third the weight of that specified to be absolutely necessary, has for a long time been working admirably between New York and Buffalo, a distance of about 480 miles.

CORRESPONDENCE.

OUR WASHINGTON LETTER.

Arrangements for the Coming Centennial Celebration of the American Patent System, which is to be held in this city next April, are assuming definite, practical shape and give promise of great success. The committees having charge of the work of organization are constituted as follows:

CENTRAL COMMITTEE.—John W. Babson, Chief of Issue and *Gazette* Division, U. S. Patent office; Brainard H. Warner, President Columbia National Bank; Myron M. Parker, President Washington Board of Trade; Marvin C. Stone, manufacturer of novelties; Robert W. Fenwick, Prof. Otis T. Mason, Curator U. S. National Museum; Hon. John Lynch, President Potomac Terra-Cotta Company; J. Elfreth Watkins, Secretary, Curator U. S. National Museum;

EXECUTIVE COMMITTEE.—Hon. John Lynch, Chairman; J. Elfreth Watkins, Secretary; John W. Babson, Marvin C. Stone, Geo. C. Maynard.

ADVISORY COMMITTEE.—Hon. H. M. Teller, Chairman Committee on Patents, U. S. Senate; Hon. O. H. Platt and Hon. George Gray, Members Committee on Patents, U. S. Senate; Hon. Benjamin Butterworth, Chairman Committee on Patents, House of Representatives; Hon. James Buchanan and Hon. George D. Tillman, Members of Committee on Patents, House of Representatives; Hon. Charles Eliot Mitchell, Commissioner of Patents; Hon. Robert J. Fisher, Assistant Commissioner of Patents; Hon. H. E. Paine, Ex-Commissioner of Patents; Hon. Ellis Spear, Ex-Commissioner of Patents; Hon E. M Marble, Ex-Commissioner of Patents; Hon. M. V. Montgomery, Ex-Commissioner of Patents; Col. F. A. Seely, Principal Examiner, U. S. Patent Office; J. B. Marvin, Chief of Draftsman Division, U. S. Patent Office; Prof. A. Graham Bell; Prof. S. P. Langley, Secretary Smithsonian Institution; Dr. G. Brown Goode, Assistant Secretary in Charge, U. S. National Museum; Major John W. Powell, Director U. S. Geological Survey; Prof. T. C. Mendenhall, Superintendent U. S. Coast and Geodetic Survey; Hon. A. R. Spofford, Librarian of Congress; Hon. Edwin Willits, Assistant Secretary of Agriculture; Col. Marshall McDonald, Commissioner of Fish and Fisheries; Hon. Carroll D. Wright, Commissioner of Labor; General A. W. Greely, Chief Signal Officer U. S. A.; General M. C. Meigs, U. S. A.; Commodore Wm. M. Folger, U. S. N.; Surgeon John S. Billings, Army Medical Museum; Capt. R. W. Meade, U. S. N.; Gen. W. S. Rosecrans, Register, U. S. Treasury; Dr. F. O. St. Clair, Chief of Consular Bureau, Department of State; Hon. J. W. Douglas, Commissioner District of Columbia; Hon. W. Ross, Commissioner District of Columbia; Col. H. M. Robert, Commissioner District of Columbia; Hon. M. G. Emery, President Second National Bank; Col. A. T. Britton, President American Security and Trust Company; Dr. J. C. Welling, President Columbian University; Rev. J. Havens Richards, President Georgetown University; T. E. Waggaman, Trustee Catholic University of America; Rev. J. E. Rankin, President Howard University; Rev. Byron Sunderland; Hon. Thomas Wilson, Smithsonian Institution; J. M. Toner, M. D.; George C. Maynard; Hon. Simon Wolf; A. L. Barber, President Barber Asphalt Company; Crosby S. Noyes, Editor *Evening Star;* Hon. Beriah Wilkins, *Daily Post;* Gen. H. V. Boynton; Chas. A. Elliot; A. D. Anderson, Secretary Board of Trade; Col. Wm. M. Meredith, Chief Bureau Engraving and Printing.

There is also a Committee on Literature, of which Dr. G. Brown Goode, assistant secretary of the Smithsonian Institution; Hon. A. R. Spofford, librarian of Congress, and Llewellyn Deane, are the members. This committee has prepared the following list of subjects of addresses to be delivered at meetings to be held at convenient times during the celebration:

The Birth and Development of the American Patent System
The American Patent Law.
The Effect of Our Patent System on the Material Development of the United States.
The Relation of Inventions to Agriculture.
The Relation of Inventions to Labor.
Invention as an Aid to the Mechanical Engineer.
Chemistry in its Relation to Invention.
The Steam Engine.
The Effect of Technological Schools upon the Progress of Invention.
Invention and Discovery in Medical and Sanitary Science.
Invention in its Effects upon Household Economy.
Invention in Mining and Metallurgy.
The Epoch-Making Inventions of America.
The Progress of Electrical Science.
The Telephone and the Phonograph.
The Effect of Invention upon the Railroad and Other Means of Inter-communication.
The Birth of Invention.

The National Committee, and auxiliary committees in various localities throughout the country, are being organized and much interest and enthusiasm are manifested. Invitations to foreign inventors are to be sent out through the Department of State. Secretary Watkins is desirous of getting opinions and suggestions from persons interested in the undertaking.

The New Electrical Board, appointed by the President to investigate all matters relating to the use of electric wires in the District of Columbia, has established its office in the District Buildings, and organized for business. Andrew Rosewater, the civil engineer, is president of the board, and Lieut. Francis R. Shunk is the secretary. Professor Rowland, the other member of the board, will come over from Baltimore several times a week to attend its meetings. At present the board is not prepared to give hearings to persons who may wish to appear before it, but will be pleased to receive useful reports or statements in relation to subways and other pertinent subjects.

A Chance for Inventors. — Commander Newell, superintendent of the Naval Electric Lighting Bureau, is endeavoring to find some electric signaling system suitable for use on board United States war vessels, for general communication between the officers of such vessels. The ordinary mechanical signals have proven too cumbersome; electric bells and annunciators, usually constructed on the cheap hotel pattern, are not durable and reliable enough for ship use, and telephones, while exactly adapted to many cases, do not answer all the requirements of the service.

Lieut. Hamilton Hutchins, of the Electric Bureau of the U. S. Navy, has invented a novel speed indicator, designed to show the speed of rotation of the shaft or propellor of a ship, or of the shaft or wheel of an engine or other machine. It is an ingenious combination of mechanical and electrical devices so arranged that the rotation of a shaft shall produce a pressure on a column of fluid, and the fluid pressure shall actuate a pointer which is made to electrically operate any number of indicators placed at suitable points.

The Military Telegraph Bill, granting certificates of honorable service to army operators, passed the House Friday, January 8th, by a vote of 136 to 81. G. C. M.

Washington, D. C., Jan. 8th, 1891.

OUR BOSTON LETTER.

The Standard Electric Company, of Vermont, recently installed one of the most compact and magnificently equipped isolated plants to be found in this or any other country, in the Washington Market at the Capitol. The equipment of the plant has the new and improved machines and apparatus manufactured by the well-known St. Johnsbury Company, including a Standard incandescent dynamo of 500 sixteen candle-power lights capacity. Mr. F. N. Ferris, general manager of the company, secured the order and supervised the installation.

The Shipman Engine Company has issued a neatly printed catalogue, giving a comprehensive description (illustrated) of its popular engine, together with other interesting matter. Every electric light station and electric isolated plant should have one of these books. It can be obtained by addressing the company, No. 226 Summer street, Boston, Mass.

The Thomson-Van Depoele Electric Mining Company, which was organized a few months ago under the laws of Maine, started business January 1st, 1891. The company's executive offices are at No. 620 Atlantic avenue, Boston. It is a separate corporation from other enterprises bearing the distinguished names above mentioned. It will manufacture under the patents of Mr. Chas. D. Van Depoele and will also act as agents for the Thomson-Houston Electric Company's mining apparatus. Mr. Hollon C. Spaulding is secretary.

Electric Freight Railway advices from Fall River, Mass., of recent date authentically state: "Plans for the establishment of an electric railway in this city are being rapidly completed; but it is understood that the promoters of the enterprise will confine the operation of the road to carrying of mill freight to and from the railroads and steamboats."

The Westinghouse Electric Company has recently increased the lighting capacity of the Berlin Falls, Mass., Electric Light Company by selling the latter a 750 light alternating machine. Another and much larger machine of the Westinghouse alternating type has been purchased by the Quincy, Mass., Electric Light Company. It will furnish 1,500 incandescent lights, and give the station a lighting capacity of 2,500 incandescent lights.

The West End Electric Cars, particularly those of the Allston and Brighton division, rendered creditable service during the heavy snow storm which prevailed in this section early in the week. The electric snow plows were continually on the go from the beginning to the end of the snow fall, and the tracks were kept clean. This not only enabled the electric passenger cars to make schedule time, but also prevented the streets from becoming blockaded. Suburban residents who patronize the electric cars are profuse in their praises regarding the excellence and convenience of the electric service, so thoroughly tested under very trying circumstances, of the West End Railway Company. W. I. B.

Boston, Jan. 10th, 1891.

OUR CHICAGO LETTER.

The differences between the Cicero & Proviso Electric Railway Company, Chicago, and the company who had the contract for the cars has, it is understood, been settled. The road will be put in operation soon.

The Central Electric Company report large sales of their imported all steel pliers, every pair of which is guaranteed. These have now been on the market for several months and are being used by the large light and telephone companies. A new calendar for '91 is among the novelties being sent out by the above company.

The Illinois Electric Material Company will soon send to the trade a very handsome catalogue.

The Electric Light Department of the city is rapidly pushing the work on the new station at 14th and Indiana avenue, and the new style pole or lamp support is fast displacing the gas lamps in the business portion of the city within the district to be lighted from this plant. D. B. D.

Chicago, January 10th.

Cranks.

In times of great trouble, emergencies and other unusual periods, the irrepressible crank turns up with never failing regularity. His advice in connection with running the campaign against the Indians has been received at the War Department. Secretary Proctor gets 20 or more letters a day from cranks with wild schemes.

One of these gentlemen tells the Secretary to establish an electric plant at Pine Ridge and to surround the hostile camp with a wire. The "juice" having been turned into the wire, Lo, the poor Indian, is to be driven down to it in herds and electrocuted!

This crank is a thoroughbred; he has a high forehead and a black roof to his mouth. Furthermore, he must be an agent for an electrical company and has doubtless accompanied the draft of his scheme with a bid for the plant.

Long live the cranks! They are nothing if not amusing, and we all can learn something from them. It would be a very humdrum world, this of ours, were it not at frequent intervals turned by the cranks.

Professor Spice at Cooper Union.

Prof. Robert Spice, of the Brooklyn Institute, lectured Friday evening of last week, at Cooper Union, on "Electrical Measurements." It was the first of a series of lectures on electrical subjects which will be delivered at the Union. The class in electricity now numbers nearly 200.

New Electric Railway Contracts.

J. L. Barclay, of Chicago, general Western agent for the Westinghouse Electric Company, and H. M. Harding, who is now with the Westinghouse Company as manager of the railway department, were in Pittsburgh last week. Mr. Barclay stated that he and Mr. Harding had closed four contracts to furnish $200,000 worth of electrical railway supplies to four companies. They have on hand estimates to fit out 347 electrical street railways, aggregating, $6,000,000, and they expect to place half of this with the Westinghouse Company.

Prompt Cable Service.

A quick piece of cable service is reported from Montreal. A cablegram was sent from that city over the Commercial cable to London at 10.27, and at 10.40, just 13 minutes, a reply was received. The message had been sent from Montreal to Canso, thence to Ireland, and on to London. A transaction was effected on the London Stock Exchange, and the reply was written, sent and received in the time named.

Daft Sues Electric Companies.

Leo Daft, the electrician and inventor, has brought suit in the Supreme Court of New York against the Daft Electric Light Company, the United Electric Traction Company and other smaller corporations of similar character, to recover some $50,000 or more of which he claims to have been defrauded. The capital stock of the United Electric Traction Company is $7,000,000, of which Mr. Daft holds a large amount of preferred stock. The electrician traded his inventions for stock in one company, but claims another company absorbed it.

We are in the season of mayor's messages; *ergo,* municipal ownership is enjoying a revival.

The building of the Congress de Dipitados, the Spanish House of Commons at Madrid, is to be electrically lighted.

Centralia, Ill., is now enjoying a lively war between the electric light company and the gas company. The gas company is an old corporation, and has been in business for years, while the electric light company only commenced business last week. Gas was formerly $2 per 1,000 cubic feet, but when the electric light plant was being agitated the price was reduced 25 per cent. and recently another cut of 33⅓ per cent. was announced.

Electricity Not to Blame.

Three persons killed and one hopelessly maimed for life in 11 days is a pretty bad record for the electric railroad in Newark. People want rapid transit, but they do not want it to take them out of the world. The road in question is operated by the trolley system, with overhead wires; a system that is an offense to the eye and to the ear, and, as these ghastly statistics show, a menace to life itself. Mem. for our local authorities: Don't give it a foothold here.—*New York Tribune.*

Such subtle sophistry is unusual in our esteemed contemporary. Perhaps it has been misinformed. For its instruction we will state that the type of electric railway used in Newark is not at fault. It is the construction which is dangerous. The usual method of constructing an overhead electric railway is to set poles on each side of a street, and suspend the trolley wire from wires connecting the two poles and supported by them.

In some places, notably Washington and St. Louis, where there is ample room, the center pole construction is used. The poles are set in the middle of the street between the two tracks, the trolley wires being supported by brackets extending from either side the pole. Generally this construction is used because it is considered less unsightly than the sidewalk construction.

The center pole ought never to be used except where there is plenty of space for passengers to get on and off the cars on the left hand side. This is the wrong side, of course, but some passengers are human and make mistakes.

The method of construction is the weak point in the Newark system. There is barely six inches space between the car and the center pole. Accidents which have happened on this road are, in nearly every instance, traceable to the fact that the passenger got off the wrong side of the car, and encountered a pole.

Does the *Tribune* condemn all steam railroads because, through faulty construction, rails sometimes spread and people get hurt?

The British Telephone Patent

The British patent for the Bell magneto-telephone expired in December. Active preparations had been made by manufacturers for supplying outputs at reduced rates, a combined transmitter and receiver, known as the Mix and Genest telephone and transmitter—operating solely on the magneto principle—being the preferred type of instrument. The microphone patent of Mr. Edison for the carbon transmitter will not expire until July, 1891, and the purchasers of the magneto outfits are guaranteed a microphone set free of charge after that date. The apparatus is so constructed that the substitution of the microphone may be easily made by the user.

FINANCIAL.

Closing quotations of electric stocks, from F. Z. Maguire & Co., Electrical Securities, 18 Wall street, N. Y., Saturday, January 10, 1891. New York, Boston and Washington Stock. Pittsburgh closing January 9.

NEW YORK.	
Western Union Telegraph Co.	79⅝
American Telegraph & Cable	88
Central and South American	*145
Mexican	210
Commercial Cable Co.	104
Postal Telegraph Cable	39
Edison General Electric Co.	88
" " " Deferred	
Consolidated Electric Light	
Edison Electric Illuminating Co.	70
United States Electric Light	30
North American Phonograph	
BOSTON.	
Thomson-Houston Electric Co.	44¼
" " " Preferred	
" " " Series C	
" " " Series D	5¾
" " International Co.	
" Welding Co.	
" European Welding Co.	
Ft. Wayne Electric Co	10⅞
TELEPHONE:	
American Bell	213
Erie	49¼
New England	51
Mexican	.75
Tropical American	1
MISCELLANEOUS:	
Edison Phonograph Doll	
WASHINGTON.	
Pennsylvania Telephone	25
Chesapeake and Potomac	67
American Graphophone	*11¼
United States Electric Light (Wash'ton)	140
Eckington and Soldiers' Home Electric Railway	56
Georgetown and Tennallytown	49¼
PITTSBURGH.	
WestinghouseElectric Mfg. Co	8¾

* Ex. Div.

Telephone News

*** Canada uses about 25,000 telephones.

*** The Rocky Mountain Bell Telephone Company has 532 subscribers and 450 miles of wire in Salt Lake City.

*** A. A. Wicks, of Dubuque, Iowa, has been appointed superintendent of the telephone exchange at Alton, Ill.

*** The Chicago Long Distance Telephone Company filed a certificate setting forth an increase of capital stock from $1,000,000 to $2,000,000.

*** The list of subscribers issued January 1st, by the Pacific Telephone and Telegraph Company is a well arranged pamphlet. An alphabetical index makes reference easy.

*** The Erie Telephone Company subcompanies show increase of gross receipts for October and November, 1890, over same months of 1889, of $14,692.66; increase of expenses, $3,825.21; increase of earnings, $10,867.45.

*** No importance is attributed by the street, says a Boston exchange, to the suit pending by the government against the Bell Telephone Company. The case has been postponed continually, and although the government may fight it to the best of its ability, it is the general impression that it has no hope of winning it.

*** The new central telephone station in Christiania, Norway, is now completed, and the arrangements give great satisfaction. In the year 1884, the Bell Telephone Company had about 1,000, and the Christiania Telephone Company, about 700 subscribers. They were then amalgamated, the new company having 1,400 subscribers, which number has now risen to 2,500 with every prospect of a further important increase. The new central station was constructed for about 5,000 subscribers. The number of telephone conversations average now about 13,000 on a week day and about 1,300 on holidays. The station is heated by a central heating apparatus, and is airy and well ventilated. There are 13 tables, each with 200 numbers, and each table is attended to by two female clerks.

A Change in the Southern Bell Telephone Company.

News comes from our southern correspondent to the effect that W. J. Cole, district superintendent of the Southern Bell Telephone Company, has resigned, and will hereafter devote himself to his electrical business in Atlanta. The REVIEW extends its best wishes for Mr. Cole's success.

To fill the vacancy thus caused in the staff of the company, Mr. J. D. Easterlin, a zealous yeoman in telephone work, and who has had charge of the second district for years, was appointed district superintendent of Mr. Cole's district also, and, with headquarters at Atlanta, will hereafter look after both these important districts. Mr. Easterlin will no doubt win additional honors with this increased responsibility, which now makes Atlanta one of the most important telephone cities of the South.

Electrical Exhibits at the World's Columbian Exposition.

The work of classification of the electrical exhibits at the World's Columbian Exposition, has been completed as far as seemed practical at present. Changes will be made as development and improvement may make necessary. The electrical display is designated "Department J," and is arranged in 16 groups (Groups 116 to 131, inclusive), subdivided into 52 classes (Classes 703 to 754, inclusive), as follows:

DEPARTMENT J.—ELECTRICITY.

Group 116, Apparatus to Illustrate the Phenomena and Laws of Electricity and Magnetism:

Class 703. Statical electricity.
Class 704. Dynamical electricity.
Class 705. Thermal electricity.
Class 706. Magnetic electricity.
Class 707. Magnets, temporary and permanent.
Class 708. Direct and induction coils.
Class 700. Galvanometers.

Group 117, Thermo Electric Batteries.

Group 118, Electric Batteries; Secondary or Storage Batteries.

Group 119, Machines and Appliances for Producing Electrical Currents by Mechanical Power. Dynamos:

Class 710. Dynamos of direct current.
Class 711. Dynamos of alternating current.
Class 712. High and low voltage.
Class 713. Commutators.

Group 120, Transmission and Regulation of the Electrical Current:

Class 714. Cables, wires and insulators; rheostats, switches, ammeters, resistance boxes, indicators and meters; voltmeters, hydrometers and converters.
Class 715. Safety and protective appliances, arresters, etc.
Class 716. Lightning rods and ornaments, insulators, rods, cables and "grounds."

Group 121, Electric Motors and their Applications:

Class 717. Movement of machinery in various industrial operations.
Class 718. Pumping and hoisting from mines.
Class 719. Propulsion of railway cars, street railway cars, mining cars, propellers, etc.

Group 122, Lighting by Electricity:

Class 720. The arc system and its fixtures, appliances, etc.
Class 721. The incandescent system, its fixtures, lamps and appliances.

Group 123, Heating by Electricity:

Class 722. For warming and heating apartments.
Class 723. For heating flat-irons and other objects in industrial operations.
Class 724. Maintenance of constant high temperature in small ovens, etc.

Group 124, Electro-Metallurgy and Electro-Chemistry:

Class 725. Electrotyping.
Class 726. Electroplating, gilding and nickeling.
Class 727. Electric deposition of iron and other metals.
Class 728. Electric deposition of metals as a means of extracting them from their ores or alloys.
Class 729. Electric furnces.

Group 125, Electric Forging, Welding, Shaping, Tempering, Brazing, etc.

Class 730. Apparatus and methods of forging, bending, twisting, making angles or straightening metals and metal work.
Class 731. Apparatus and methods of welding and joining iron, steel and other metals.
Class 732. Brazing, soldering, tempering, etc.

Group 126, Electric Telegraph and Electric Signals:

Class 733. Various systems of transmitting and recording.
Class 734. Electric chronographs.
Class 735. Annunciators.
Class 736. Burglar alarms.

Group 127, The Telephone and its Appliances:

Class 737. Cables; construction; underground work.
Class 738. Protection of strong current apparatus.
Class 739. Switchboards.
Class 740. Transmitting apparatus.
Class 741. Receiving apparatus.
Class 742. Signaling apparatus.
Class 743. Subscribers' apparatus; numbers, code, registers, etc.

Group 128, The Phonograph:

Class 744. Receiving and recording apparatus.
Class 745. Apparatus for the reproduction of recorded sounds and articulate speech.

Group 129, Electricity in Surgery and Therapeutics:

Class 746. Electric cauteries and apparatus.
Class 747. Apparatus for application of the electric current as a remedial agent.
Class 748. Apparatus for the destruction of life.

Group 130, Applications of Electricity in various ways not before specified:

Class 749. Ignition of explosives, gas lighting, etc.
Class 750. Control of heating apparatus by electricity, as applied to steam and hot air pipes and registers.
Class 751. Electric pens.
Class 752. Application in photography.

Group 131, History and Statistics of Electrical Invention:

Class 753. Objects illustrating the development of the knowledge of electricity and of the application of electricity in the arts.
Class 744. Collections of books and publications upon electricity and its application.

Electrical Conveniences at the Central Railroad Station, Jersey City, N. J.

The diagram presented herewith shows the arrangement of electric circuits for conveying signals between various points in the yard and passenger station of the Central Railroad of New Jersey, at Jersey City, N. J. Frequent communication between these points is essential, and the present system dispensed with two messengers, while at the same time, it added much to the smoothness of working. The diagram, for which we are indebted to the *Railroad Gazette*, shows the train shed with the tracks in and leading to it. The outlines of the shed are indicated by dotted lines. The location of the tracks is readily understood by reference to the *pairs* of light lines. The heavy lines indicate cables carrying from 10 to 30 electrical conductors each.

A A A A A is a wire connected with a point on the track about 1½ miles out, to announce the approach of trains. The electric current in this rings a bell in the tower and another at the desk of the boat starter *Z*. *B* is the office of the man who orders engines back into the train shed at the proper time to take out passenger trains. The turn table is some 2,000 feet from the platforms, and until the present arrangement was introduced there was often considerable confusion and delay by reason of engines backing into the station at the wrong time or in irregular order. As suburban trains have to depart very close

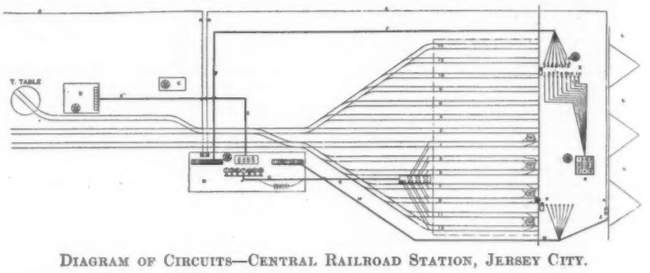


DIAGRAM OF CIRCUITS—CENTRAL RAILROAD STATION, JERSEY CITY.

together, this was an important point. Now the engines invariably wait at *B* until they are notified that their respective trains are quite ready, thus avoiding unnecessary switching after going upon the main tracks. *C* is the yardmaster's office and *D* the interlocking tower. *E* connects the annunciators in *B* with the tower. *F* is the cable connecting the tower with the cabin of the platform man who directs the passengers to trains and who announces to the tower and to the train dispatcher the exact moment of departure of each train. *G* is the cable connecting the track circuits of the inward tracks with indicators in the tower, which show the tower man what tracks are occupied and what are not. These circuits are worked by batteries located at *W W W W* in wells sunk in the ground. The annunciators are directly in front of the tower man, and when down are a constant warning against the possible mistake of letting two trains in upon the same track. *H* is a cable carrying conductors by which annunciators in the tower are dropped by the station baggagemaster, who by this means informs the man at the tower when all the baggage has been unloaded from an inward train and the cars are ready to be backed out.

K represents annunciators in the train dispatcher's office, which is located in the second story of the station. These are actuated by the platform man at *X*. *L L L* are the ferry slips and *Z* is the location of the boat starter. By means of wires through cable *H* the starter announces to the tower the exact time of the arrival of each boat from New York. Practically the whole of the outward business at this station comes by ferry from New York. This being so, the yardmaster must have prompt information of every irregularity in the boat service. The average time required to discharge a boat and get the passengers and baggage into the cars being known with great precision, switching operations are much facilitated by the quick and easy communication from the ferry slip.

B, C, D, K, and *X* are connected by telephone. All these telephones (indicated by stars) are on the same circuit. Every signal is given reciprocally. For instance, when a train is ready to start from track 6 the man at *X* operates "plunger" 6 thus, by means of one of the wires in cable *F*, dropping annunciator 6 in the tower *D*. *D* in response rings a bell at *X* acknowledging the signal. In case of derangement of the circuit or apparatus, *X* would resort to the telephone. It will be observed that this operation makes no noise at *D*. When this train starts, *X* notifies *K* in a similar manner and gets a similar response.

The annunciators at *B*, instead of being numbered by tracks like the others, are lettered to indicate the *names* (not numbers) of the various trains for which engines are required. As generally not more than four trains are made up at any one time, eight annunciators are amply sufficient. All the annunciators are of the simple style common in hotels and sleeping cars.

The characteristic features of the system are the noiselessness, just referred to, and the use of separate wires for each operation. The first cost of so many conductors is, of course, high as compared with single circuits, over which communication could be had by telegraph, telephone or bell signals; but the facility and simplicity of operation is so much greater under the system adopted that its cost is regarded as amply justified.

Another Fine Collection.—More Thanks.

Steel engraved calendars seem to be the fad this year.

The Holtzer-Cabot Electric Company, 111 Arch street, Boston, have sent a large and handsome one, portraying the noble stag. His horns look like they were wired for electric lights.

Nicoll & Roy, printers, 16 Dey street, New York, gave us a tastefully printed card calendar, accompanied by a very artistically executed folder.

The American Electrical Works, Providence, R. I., send a calendar with a steel engraving of their factories, which cover a whole block of ground. Mr. Phillips' usual good taste is displayed in his selection of the design for this calendar, which is handsome.

The Wightman Electric Manufacturing Company, Scranton, Pa., send a lithographed monochrome calendar, representing a careening ship in mid-ocean. The foresail bulging before the wind, carrys the company's "ad." which is to the effect that they are "in the lead."

The Electrical Supply Company, Chicago, have sent a handsome pamphlet with a portrait of Mr. E Pluribus Unum on the third page. Mr. Unum was created by a photographer and is a composite individual with the characteristics of the 10 leading men in the company. A novel idea, indeed.

The Commercial Cable Company sent a large, square calendar, printed in blue and brown inks. An odd conceit is the printing of the weekly calendar on *fac-simile* cablegram blanks. A map of the company's lines furnishes the illustration for the body of the card.

Alexander, Barney & Chapin, 20 Cortlandt street, New York, sent their friends the compliments of the season on a card carrying a tasteful design. "Fewer Cares" and "Increased Earnings" were desired for all.

National Electric Light Association.

Gen. C. H. Barney, chairman of the Committee on Exhibits, informs us that the allotted space for electrical exhibits in Union Hall, opposite the Narragansett Hotel, Providence, has been nearly all applied for. Those still desiring to secure space, must positively have their applications in Gen. Barney's hands by the end of this week. This electrical exhibition in connection with the meetings of the convention, will be a special feature and should be as nearly representative as possible.

The Interesting Telephone Situation in England.

The interest felt by the public in the cessation of the present telephone monopoly found expression in a question asked last week in the House of Commons, says our esteemed contemporary, London *Engineering*. Dr. Cameron inquired of the Postmaster-General if he would make known his decision as to applications for licenses submitted to the post office by proposed competitors desiring to introduce loud speaking and long distance telephones, and other forms of improved instruments. He was told that the decision would be shortly announced, and so for the present the matter remains in abeyance. The reason of the activity which just now prevails in telephonic affairs lies in the expiration, on the 12th ultimo, of the Graham-Bell patent for the electro-magnetic telephone receiver. This patent is some six months older than that granted to Edison for his carbon transmitters, which will not expire until July 30, 1891. After that date there will be no longer any master patent relating to telephonic affairs in force in this country, and any one will be free to devise and manufacture apparatus for the transmission of the human voice, provided he does not infringe the numerous more recent patents taken out for matters of detail. As six months is only a short time in which to institute exchanges, those who have such enterprises in contemplation are naturally anxious to learn what line of action the post office intend to take. The profits made by the National Telephone Company are so good, and the spirit of competition so keen, that the present company cannot hope to be left in undisturbed possession of the ground. Their would-be rivals have, however, to obtain a license from the Postmaster-General before they can commence operations, it having been ruled that an exchange system is an infringement of the government monopoly in telegraphs.

It cannot be doubted that, unless the government intend to enter into the telephonic businesses themselves, they will issue licenses to all persons that can give proof of their capacity, financial and otherwise, to carry out an exchange system. The existing procedure with regard to railway, gas and water undertakings does not apply to this case. In the two latter, monopolies are granted because it has been found that the inconveniences of free competition outweigh the advantages, and that it is quite possible to exact guarantees in respect of price and quality that afford a very fair measure of protection to the consumer. In regard to railways, it is felt that the power of compulsory purchase which they possess, ought not to be given unless a distinct advantage can be gained to the public, and consequently Parliament does not favour the construction of competing lines in districts already provided with railways. In the case of telephones the construction of competing exchange systems will not interfere in the same way with the rights or comforts of the townspeople. It will naturally be very annoying for the subscribers to find that the persons with whom they desire to converse are not on their particular system, but that is a private matter, and in the end the fittest will survive. Either one exchange will absorb all the others, or else people having interests in common will collect onto one system.

But although it would be improper for the government to interfere to protect the existing company from competition, it might very well take advantage of the occasion to impose terms regulating the erection and care of overhead wires. It has already framed rules of the greatest stringency for the guidance of electric light companies, and there is no reason why it should not show its solicitude for the safety of another portion of the public. The tangle in the sky is a constant menace to the pedestrian, and will grow more and more dangerous if a keen competition should be established between rival telephonic companies. When rates begin to be cut we shall find thinner wires, lighter poles and flimsier attachments employed, and the evil results of a gale or a snowstorm will be increased. It is in the power of the post office to prevent all this and to secure that all future extensions shall be properly erected and efficiently maintained.

The telephone has come to stay, and it is useless to try to blind the fact. The government have allowed the opportunity of buying it up to pass, and for the next seven years this will not recur. The monopoly conferred by the patent law has almost expired, and we are now on the eve of a period of easier rates and, we hope, better service. The various companies now merged into the National Company commenced with a heavy capital, of which much was sunk in the purchase of patents, and they had only a limited time in which to *recoup* themselves. Consequently, their great object was to extend their businesses and cover the entire country, so that at the end of their period it should be useless for any one else to try to compete with them. They are now in a very strong position, and can take as their motto *Beati possidentes*. But their method of doing business has been most irritating to their subscribers, and in many places, particularly in London, these would transfer themselves in shoals to a company providing a better service, were it not for the inconvenience of being attached to a system that does not include everybody. We understand that serious efforts are being made to improve matters, and it is rumored that complete metallic circuits are to be erected in London, with the cessation of much of the induction which now fills the telephone with confused voices and noises. This change will mean the doubling of existing wires, and in view of this it is worth while considering if the telephone companies should not be given the right to break the streets, subject to the control of the Board of Trade. The reduction of rates which has already begun in Sheffield and other towns, will cause a rapid extension of the system and an increase of the present annoyances, unless better methods be followed. The companies have already asked for this power, and it seems to be the best way of improving the present muddle. No doubt we should all grumble at finding the roads and the pavements again cut up, but life in cities is made up of annoyances, and to turn off the pavement occasionally is decidedly preferable to being cut across the face by a falling wire. The telephone system of Newcastle is underground, and gives very good results, possibly better than in any other town in the country.

A speech made in the House last autumn, and the delay that has taken place in replying to the application for licenses, lend probability to the idea that the government are thinking of entering into the telephonic business themselves. If they do that they will certainly refuse to issue any more licenses, for it would be absurd to raise up competitors to an undertaking to be carried out with public funds, and of which the legal monopoly is vested in the Postmaster-General. It was anticipated that the National Company would have been bought up, but the Postmaster-General referred to the expiration of their patents in a way that suggested that he intended to try the effect of a little competition upon them before he broached the subject of purchase. If he should really contemplate a rival undertaking he will certainly start with some important advantages. To begin with, he will have the accumulated experience of the last 10 or 12 years, and will, therefore, be able to offer a much better service. He can break the streets for laying the wires just as he chooses, while the question of way leaves overhead would present fewer difficulties to a government department than to a private company. Most subscribers, also, would appreciate the advantage of a direct connection with the telegraph system of the country. At the same time there is the initial difficulty to be faced of tempting people to leave a widely extended exchange system for one of very limited proportions, and this would do much to incline the balance of advantages to the side of the National Company. It is difficult to decide which of the competitors would find the struggle the more expensive.

The time has come when the post office authorities must definitely decide whether they are going to undertake telephonic business or not. If they determine to have nothing to do with it they cannot refuse to issue licenses to responsible applicants, and if, after doing so, they should change their minds, or be forced by public opinion to change their policy, they will be in the awkward position of having to buy up concerns that should never have come into existence. It only needs for people to feel the inconvenience and confusion that may easily follow the institution of rival exchanges, for an overwhelming demand to be made for the government to take over the entire service. They will then have to purchase disconnected systems, operated on different plans, and will find that a great expenditure will be needed to make the whole work together harmoniously.

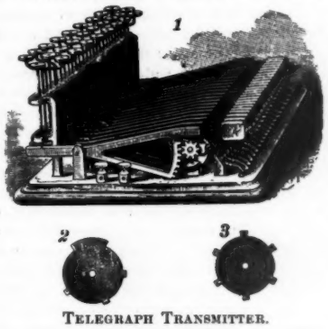
Buffalo Electrical Society.

Mr. William Finn of the Western Union Telegraph Company, read an interesting paper on "Earth Currents," before the Buffalo Electrical Society, the evening of January 5th. The lecture was illustrated with diagrams and stereopticon views. He found that the earth current effects in this country are very much more marked as a rule than in England where he had made similar observations some years ago. He attributes this to the fact that the intensity of the magnetic field is much greater in Buffalo than in England, which enables the telegraph student to make his records from an ordinary tangent galvanometer, but which required a sensitive astatic needle across the Atlantic.

A New Telegraph Transmitter.

Dr. Wesley Smith, 24 West 30th street, this city, has patented the transmitter shown in the accompanying illustration, for which we have to thank the *Scientific American*.

Aligning vertical supports on a suitable base carry horizontal shafts on which are disks having projections varying in length, and adapted by means of varying contact with the trailer to transmit dots and dashes. The disk used in sending one of the longer characters is shown in Fig. 2, which represents a "v" in the Morse alphabet, requiring a dash and three dots, Fig. 3 showing a disk used in sending one of the shorter characters, as the letter "e," which would be represented by a dot. Fixed on each disk-carrying shaft is a ratchet wheel, adjacent to which is a pinion carrying a spring-pressed pawl,



TELEGRAPH TRANSMITTER.

with other mechanism, the arrangement being such that the character disks may be given a whole revolution or any part of a revolution by each movement of the key, the motion being limited and regulated by the mechanism.

Each key rests on an outer projecting end of a carriage pivoted between vertical supports, there being near the opposite end of the carriage a segmental rack meshing with the pinion on a disk-carrying shaft, the carriage also having a projecting screw-threaded portion carrying a weight adjustable by means of a nut. Each key is marked with a letter corresponding with the projections on one of the disks, and any person who can read the letters can operate the transmitter, it being only necessary to depress a key to transmit a letter. The movement of the sending mechanism is regulated by the downward movements of the weights whereby the motion of the character disks is made steady, and accuracy and rapidity are assured. Each key and its mechanism works independently, forming a transmitter in itself. This instrument may be adapted to any code of signals.

Another Stay For Jugiro.

Judge Lacombe, of the United States Circuit Court, January 7th, filed his denial of Lawyer Roger M. Sherman's petition for a writ of *habeas corpus* on behalf of Shibuya Jugiro, who is under sentence of electrocution for murder. Mr. Sherman requested permission to appeal to the Supreme Court, and the request was granted. This order will act as a stay of execution until the October term of the court.

A dispatch from Albany, dated January 9, reads: Attorney-General Tabor received the papers in the appeal to the United States court in the Jugiro case, granted by Judge Lacombe recently, before leaving for Buffalo, at noon to-day. Deputy Attorney-General Hogan, in commenting upon the appeal, said:

"It is just what we expected after the decision in the Wood case. That gave any lawyer the right to appeal to the United States courts, no matter how frivolous the nature of his appeal, and then, when it was denied, to appeal again to the United States Supreme Court. But people make a mistake when they think that the electrical execution law alone is defeated by these appeals. The United States statute which has caused this trouble covers every State. Any criminal condemned to be hanged in any other State can take his case to the United States Supreme Court. Practically, capital punishment is abolished in every State of the Union by that statute. Until it is repealed, as it should be at once, murderers all over the United States can stay their executions."

TELEGRAPHIC

.... Telegraph business in Sioux City, Iowa, for 1890, shows a large increase over previous years.

.... The Western Union Telegraph Company's new building in St. Louis will be equipped with dynamos instead of batteries.

.... A New York rifle club proposes to hold a shooting match by telegraph with similar organizations in the Middle Atlantic States.

.... A Paris cablegram says that the Canadian Telegraph Company has acquired an interest to the extent of $1,500,000 in the Commercial Cable Company.

.... The Western Union Telegraph Company has established a repeating office at Flagstaff, Arizona, the only one between Pueblo, Colo., and Los Angeles, Cal.

... The International Postal and Telegraphic Congress will meet at Vienna, May 20th, 1891, with Marquis Bacquehem, Austrian Minister of Commerce, as president.

.... A 1,300 word cablegram passed through the Western Union office in this city, last week, on its way from Lima to London. As the rate was over $2 per word, this little dispatch cost more than $2,600.

.... Charles Plumb, superintendent of the Buffalo Police Electrical Department, has run his wires over electric light and power lines and equipped them with a device by which sagging and straining are compensated.

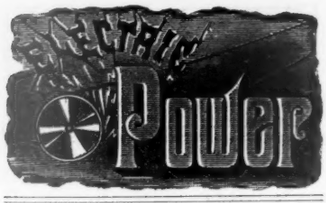
.... The Postal Telegraph Cable Company has just opened new offices at the following places: Louisville, Ky., Lafayette, Ga., Brazil, Ind., Elbensburg, Huntingdon, Hollidsburg and Orbisonia, Pa., and La monte, Mo. There are direct wires to all these places.

.... When Mr. and Mrs. Cyrus W. Field celebrated their golden wedding, on December 2d, a congratulatory address was cabled to them from many friends in London. A magnificent vellum album containing the autographs of the senders of the address, as well as the original copy of it, has been received by Mr. Field. It contains the signatures of the Duke of Argyle, Canon Farrar, Lord Monck, W. E. Gladstone, the Marquis Tweeddale, Sir H. D. Gooch, Catherine Gladstone, Jane Cobden, Admiral Sir Richard C. Mayne, Lord Stanley, of Alderley, John Chatterton, Constance Wilde, Oscar Wilde, Gen. Sir William McMurdo and many others.

.... The corporation tax law passed by the last Vermont legislature, and which went into effect January 1st, requires all foreign corporations doing business in the State to pay a certain per cent. of their earnings into the State treasury. Manager Shaw said to a Rutland *Herald* reporter that he had not received any notice to advance the rates between the different points in Vermont and was of the opinion that there would not be any change. Manager Mason, of the Commercial Union Telegraph Company's office, also stated that he had not received any notification to raise the rates and did not expect any. The New England Telephone Company is another foreign corporation, but there has not yet been any change in the charges for the use of instruments.

Production of Copper.

The production of copper in the United States in 1890 amounted to 278,610,000 pounds, thus far exceeding any previous record, and being 20 per cent. greater than the output in 1889; it now amounts to more than 50 per cent. of the world's output of this metal in 1889. The electrical industry is a great user of this metal.



* * The Elkart Street Railway and Electric Light Companies have consolidated.

* * Evansville, Ind., with over 50,000 people, cannot see the advantages of electricity over mules for street railways.

* * The Arlington Heights, Texas, Street Railway in 1890 built, equipped and placed in operation four and one-half miles of electric line.

* * The electric street railway at Galveston, Texas, is being rapidly completed. There will be 16 miles of track. The Rae system will be used.

* * The Germania Electric Company has purchased the shop of the Commonwealth Shoe & Leather Company in Marlborough, Mass., and will manufacture all kinds of electric apparatus.

* * Electricity is now used to detect light weight coins. That must be why electric car conductors can never be induced to accept three-cent pieces for dimes.—*Brockton, Mass., Enterprise.*

* * James Dayton, manager of the Arlington Heights Electric Railway, was shot, January 7th, at Fort Worth, Texas, by James Brotherton, engineer at the power house. Brotherton acted in self-defense. Dayton will die.

* * The new Milwaukee Street Railway Company, which includes all the Milwaukee electric light plants and street railways in which Villard is interested, has just given a mortgage on all its property to the Central Trust Company, of New York, for $10,000,000.

* * A local surface road in the Harlem district asks permission to do away with horse-power and to substitute electricity. Why can't the early days of this new year be made memorable by granting such requests, which however much of interest and of profit they may suggest to the corporations making them, are certain to bring an advanced kind of rapid transit to a long suffering and indignant people?—*New York Press.*

* * Herr Lembcke, the director of the School of Weaving in Crifeld, Germany, reports that satisfactory trials have recently been made in the working of silk weavers' looms by electric motors in their own houses. The working of the looms by transmission of electrical power from a central station is found to be more satisfactory than the working by means of heat engines or gas motors.

* * Electric railways are in the course of construction or already completed at several places in Sweden, and the use of electricity is being rapidly developed, both for lighting and general industrial purposes. At Grongärde an electric railway will be built for the purpose of connecting the Björnherget iron ore deposits with the Grongesberg railway station. The railway, which will be about a mile long, is intended for the transport of iron ore.

* * The recent demonstration and tests of the conduit system of wiring made by the Interior Conduit and Insulation Company, of New York, in the city of Chicago, before the city authorities, electrical experts, insurance representatives and later before the Illinois Chapter of Architects, were very elaborate in detail and were the means of convincing all who were fortunate enough to be present of the great advantages of this system. Mr. J. P. Barrett, superintendent of the Chicago city electrical bureau, has unqualifiedly endorsed the system, as has also Mr. T. A. Bowdon, of the Chicago Fire Underwriters' Association. The Interior Conduit and Insulation Company have recently received a gold medal—first award—at the Mechanics' Fair Association, of Boston, Mass., for their admirable system.

Selenium Cells.

In a communication to the Physical Society, Mr. Shelford Bidwell noticed some interesting peculiarities of selenium cells. Selenium exists in two allotropic forms, one vitreous, as structureless as glass, closely resembling black sealing wax, and when in thin films is capable of transmitting ruby-colored light; the other form is amorphous and exists as a red powder, but becomes black if exposed for a half-hour at a temperature of 200 degrees. The amorphous variety is a non-conductor. Although generally stated in books to be a good conductor, the specific resistance of one specimen which had been carefully annealed was as high as 2,500 megohms. The annealing in presence of copper produces a great difference in the action of the selenium, probably due to the formation of conducting selenide of copper. In the course of ten years one cell had fallen from a resistance of 80,000 ohms to 10 ohms, thus illustrating the variability of the resistance of the selenium cell. In order to see if passing a strong current through a selenium cell would liberate the selenium more rapidly than it could combine with the copper anode (one of two continuous copper wires, between which a thin layer of selenium was placed), he connected one of the cells with a 26 volt battery. The result of this experiment was the formation of moist red tufts, consisting mainly of amorphous selenium all along the copper wire forming the anode. It was shown to consist of amorphous selenium by turning black when warm and exhibiting the characteristic blue flame of selenium when burned. The moistness of the tufts seemed greater than was to be expected. The red powder when examined under the microscope was found to be mixed with white lumps, which might be an oxide or hydroxide of selenium. The particular form of selenium cell experimented with was composed of a strip of mica, a few centimetres in length, having two coils of copper wire wound upon it, the convolutions of the coil being about one-twentieth of an inch apart. Melted selenium was put between the two coils and the cell kept for some time at a temperature of 217 degrees. In the case of a number of such cells the resistance gradually diminished in the course of a few years, in other words, the variation was not uniform. Different colored plates of glass interposed between a selenium cell and the source of light, as a gas burner, exhibited different effects. Blue and green glass had the effect of preventing the action of light upon the selenium. A peculiar fact was that of two blue glasses tried, the light blue exerted a screening effect, while the much darker blue did not. This was supposed to be due to the fact that the dark blue glass being colored with cobalt allowed a good deal of red light to traverse it. In the discussion which followed the reading of the paper, Professor Minchin stated that more attention had been given to the influence of light on the resistance of selenium cells than to its power of developing an E. M. F. in them. He stated that some cells with which he had experimented developed an E. M. F. of 0.25 volt under exposure to the very small amount of daylight present on a densely foggy day. He found that it was unnecessary to have a long continuance either of the heating or cooling process in making cells, as was commonly thought necessary. He had found that when the cells were kept on open circuit no deterioration occurred with prolonged exposure to light, but that there was such deterioration when the circuit was kept closed. Prof. S. P. Thompson stated that he had tried using platinum electrodes in his photo-electric selenium cells, but abandoned it on account of the high resistance of the cells. He found it necessary to continue the annealing process only until the color became slatey gray. He suggested that selenium cells might be applied to the regulation of a seconds pendulum with absolute freedom from contact of any kind. The difficulty with the use of platinum electrodes was believed to be due to an improper adhesion between the selenium and platinum, although it might be due to the non-formation of a selenide with platinum.

The Robertson Carbon Protector.

The cut shows an ingenious device for protecting carbons and carbon rods from the effects of sleet and snow. The protector is made of galvanized sheet iron and japanned, and is strong enough to withstand a great deal of hard usage.

At the bottom is an extension feature that permits the protector to be adjusted to almost any size of lamp, and the cut shows one side thrown up to allow the trimmer to give the lamp necessary attention. The lower flange is also shown partly extended.

New Carbon Protector.

Several hundred of these protectors have been in use in Minneapolis for some time, and have given perfect satisfaction. The device can also be used as a spark arrester. The Central Electric Company, of Chicago, are introducing the article.

Electric Lights in the Hofburg.

For the last day or two, says a Vienna correspondent, the time-honored Hofburg has been, after dusk, one great illumination, the windows looking over the Burgplatz and the Franzensplatz, or the inner square of the Hofburg, being a blaze of light. The explanation is that experiments have been made with the electric light, which is to be installed throughout the palace. For the present only 52 halls, reception rooms and apartments have received the new illuminant, but next Spring it will be extended to the remaining 41 rooms, which are now occupied by the Emperor, the Empress and the Archduchess Stephanie, and are, therefore, not ready for the workmen.

The incandescent system is the only one adopted, and the chief difficulty experienced in fixing it arose from the strict orders against any alteration of the character and outward appearance of the handsome candelabra, in embossed gold and crystal, which date from the time of the Emperor Francis I. In the great Ceremoniensaal alone there are 27 of these, with 54 lights apiece. The difficulty was surmounted by inserting small white lacquered wooden tubes, resembling candles at a distance, into the old lustres, each tube being fitted with a movable lamp. The entire installation, when completed, will consist of 5,250 incandescent lamps, equal to 30,000 wax candles, in the apartments, and nearly 1,800 lights in the entrance halls, galleries and staircases, or some 7,000 lamps in all. This will be the largest installation of any one building in Europe. The length of the wires inside the building will be 15 English miles.

The experiments made last night and to-night were completely successful, and it was interesting to notice how well the magnificent ceilings were brought out, and what an unsuspected wealth of color was developed in the famous Flemish tapestries on the walls of the Privy Council Chamber and other apartments.

PERSONAL.

Mr. J. Frank Morrison has retired from the Southern Electric Company, Baltimore, and Mr. D. Howard Tuxworth will continue the business.

Mr. R. Z. Jimenez, C. and E. E., of the Thomson-Houston International Electric Company's engineering department, passed through New York last week, on his way to Havana, Cuba.

A. G. Reynolds, of Toledo, O., formerly connected with the Thomson-Houston Company, has been engaged by the Quincy & Boston Street Railway Company to fill the vacancy caused by the resignation of Supt. John A. Duggan.

Mr. Charles Dutton, auditor of the Southern Bell Telephone Company, returned last week from Atlanta, Ga., where he had enjoyed a visit of several days and, likewise, looked after the affairs of his company in his usual artistic and vigorous style.

Charles D. Butterfield, a well-known telegraph operator, died in Chicago last week, from a self-inflicted knife wound. He was one of the few Associated Press men who could change off at a moment's notice from a caligraph to a Remington typewriter, and also possessed the remarkable ability of following eight and ten lines behind on the machine.

Mr. W. T. Hunt, for many years identified with the business department of the *Electrical World*, has purchased an interest in the *Electric Age*, and hereafter will devote his time and energy to building up that journal. Mr. Hunt is an untiring worker, and has our best wishes for success. His company gave a dinner Saturday evening of last week that was enjoyed by many of the electrical newspaper men of the city.

Judge William Thomas Lawrence Muller, of the New York State Court of Claims, died of pleurisy January 5th. About 10 years ago he formed a partnership with David B. Hill, and after the latter's election to the Governorship acted as his confidential adviser. The partnership continued until about a year ago, when he came to this city and became head of the legal firm of Muller, Chapman & Sweetser. Judge Muller was also president of the Crosby Electric Company, of this city.

Mr. C. A. Benton, for many years actively identified with the Edison interests, has accepted the responsible position of manager of the railway department of the Detroit Electrical Works, Detroit, Mich. Mr. Benton is an energetic, wide-awake electrical worker, and the REVIEW extends its best wishes for his success in the new field. The Detroit Electrical Works is one of the well known and strongly established electrical concerns, and is pushing electrical interests in all directions with energetic men at the head of each department.

A Neat Souvenir.

The General Electric Company, 71 Queen Victoria street, London, have sent us a very complete catalogue of their products. The catalogue is printed in colors, bound in limp cloth and embraces everything electrical, from a dynamo to a cut glass shade. Printed in gold on the front cover is the following: "To the Editor ELECTRICAL REVIEW, with the General Electric Company's compliments."

New Work of the Berlin Bridge Co.

The new iron roof for the extension of the Rolling Mill for the Lackawanna Iron and Coal Company, at Scranton, Pa., will be built by the Berlin Iron Bridge Company. The same company are also putting up the new casting shop for the Midvale Steel Company, at Nicetown, Pa.

The new muffle room for the Scoville Manufacturing Company, at Waterbury, Conn., is now completed. The side walls are of brick and the roof is of iron designed and built by the Berlin Iron Bridge Company, of East Berlin, Conn. The same company have also just completed a new boiler house for the Orono Pulp and Paper Company, at Basin Mills, Me.

Polarized Electro-Magnets.

ABSTRACT OF A CANTOR LECTURE BY PROF. SYLVANUS P. THOMPSON.

There is one class of electro-magnetic mechanism which ought to be carefully distinguished from the rest, namely, that in which in addition to the ordinary electro-magnet a permanent magnet is employed, generally referred to as polarized mechanism. The objects of the introduction of the permanent magnet are quite different in different cases. There are three distinct purposes which may be subserved; first, unidirectionality of motion: second, increased rapidity of action and sensitiveness to small currents; third, an increase of mechanical action of the current. In an ordinary electro-magnet, it does not matter which way the current circulates; the armature is pulled in either case. There is a curious old experiment which Sturgeon and Henry showed, that if you have an electro-magnet with a big weight hanging on it and then suddenly reverse the current, in spite of the reversal of magnetism the weight is still sustained. It has not time to drop before the magnet is again charged with magnetic lines the other way on, but if the armature is itself a permanent magnet of steel, it will be pulled when the poles are of one sort and pushed when the poles are reversed; that is to say, with a polarized armature there is unidirectionality of motion in correspondence with the current. One immediate application of this incident is in duplex telegraphy. Two messages may be transmitted at the same time in the same direction, by having a set of ordinary electro-magnets with a spring-actuated armature of soft iron, which will be responsive to currents of either direction, depending only on strength and duration, and another set of electro-magnets with polarized armature, which will be affected not by the strength of the current, but by the direction of it. Another form of polarized mechanism is made by attaching the cores of the electro-magnet to a steel magnet, imparting to them an initial magnetization. Such devices were used by Brett in 1848, and by Hjörth in 1850. S. A. Varley patented in 1871 an electro-magnet having a core of steel wires united at their ends. Wheatstone used an apparatus consisting of an electro-magnet acting on a magnetized needle. Sturgeon had described the very same device in 1840. In using polarized apparatus, reverse currents are necessary to operate it. Sending a current in one direction will move the armature one way, and reversing the current will move it the other way. A familiar instance of polarized mechanism is the ordinary magneto electric calling apparatus; no battery is used, but there is a little alternating current dynamo worked by a crank, the reverse currents causing a pivoted polarized armature to oscillate to right and left, throwing a little hammer to and fro between two poles.

At first sight it is not very apparent why putting a permanent magnet into a thing should make it more sensitive or more rapid in action. One might suppose that the armatures would remain stuck to the poles when once attracted, and, indeed, for many years it was supposed that permanent magnetism in the electro magnet was anything but a source of help. It was regarded as an unmitigated nuisance to be got rid of by all available means, until, in 1855, Hughes shows how very advantageous it might be made. He used a compound permanent magnet of horse-shoe shape, provided with coils on its pole-pieces and a spring-actuated armature attached to a pivoted lever. The spring was so set as to detach the armature, but the permanent magnet had just enough force to hold the armature on. By adjusting a little screw behind the spring the two contending forces were so adjusted that they were in the nicest possible balance, the armature holding on by magnetism and the spring just not able to pull it off. If, now, when these two actions are so nearly balanced you send an electric current around the coils, if it moves in one direction it just weakens the magnetism enough for the spring to gain the victory and up goes the armature. Such an apparatus is capable of responding to extremely small currents.

Another purpose subserved by polarized mechanism is the increase of the mechanical action or pull and for this purpose it is used in telephone receivers. For a long time it was not at all clear to me how far this was due to magnetic permeability of iron at different stages of magnetization, and how far it was due to other causes. Prof. George Forbes gave me the clue to the true explanation. It lies in the law of traction that the pull between a magnet and its armature is proportional to the square of the number of magnetic lines that come into action. If we take N, the number of magnetic lines acting through a given area, then the pull will be proportional to N^2. Suppose that these N lines are due to permanent magnetism; now, suppose the magnetism to be altered—made a little more, and the increment be called d N, so that the whole number is now $N + d N$. The pull will now be proportional to the square of that quantity, which

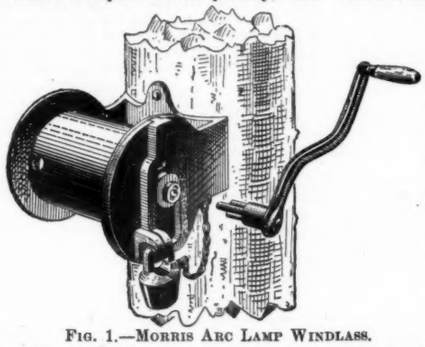


FIG. 1.—MORRIS ARC LAMP WINDLASS.

is $N^2 + 2 N \cdot d N + d^2 N^2$. As the initial pull was only N^2 we will see that the additional lines of force added have altered the pull by the very considerable quantity $2 N \cdot d N + d^2 N^2$, thus indicating that the increase of pull is not simply proportional to the change of magnetism, but also to the initial quantity of magnetism. The more powerful the pull to begin with the greater is the change of pull when you produce a small change in the number of magnetic lines. That is why you have this greater sensitiveness of action when using Hughes' electro-magnets and greater mechanical effect by applying permanent magnetism to the cores of telephone receivers.

New Pole Devices.

The John B. Morris Foundry Company, Cincinnati, manufacturers of grey iron castings and soft iron for electrical work, have put upon the market the two ingenious and useful devices shown in the accompanying illustrations.

Fig. 1 illustrates the Morris arc lamp windlass. It will fit any size pole and possesses many features of merit. The drum is made of iron, and the ratchet is enclosed in a case protecting it from snow and sleet. A padlock and handle of peculiar design make it impossible for any one to tamper with or operate the windlass without the proper key and handle. One handle will operate any number of windlasses.

The Morris pole ratchet is shown in Fig. 2. Like the windlass, this device will fit any size pole. Simplicity and low cost are two strong points which recommend it. There are no springs or clicks to freeze or get out of order, and no ropes to tie. It is quickly adjusted, easily operated, and looks strong enough to last forever.

FIG. 2.—MORRIS POLE RATCHET.

—— A few years ago, says the *Stationary Engineer*, no one dreamed that in so short a time the electric light would become a regular part of the equipment of mills and factories. It was only when the dynamo found its place in the engine-room and the incandescent light sparkled in the shops and work rooms that the engineer found anything of special interest to him in the study of electricity. Now he must study it whether he will or no, and though the knowledge he most requires must be of a practical nature, he must have a goodly amount of theoretical or "book" information in order to understand what he is doing.

New York's Mayor's Message.

Mayor Grant read his annual message to the board of aldermen January 5th. Under the head of "Poles and Overhead Wires" is the following:

The work of removing the poles and overhead wires has been continued without interruption during the past year, and in every instance in which the companies have contested the right of the municipal government to compel the removal of these poles and wires the city has been successful. The Board of Electrical Control during the past year has constructed for the reception of telegraph and telephone conductors 178 miles of single duct in nine miles of street trench, making a total construction of telephone and telegraph subways of 697 miles of duct in 38 miles of street trench. There have been constructed 133 miles of duct in 39 miles of street trench for electric light conductors, making for electric light service constructed up to date 647 miles of duct in 85 miles of street trench. There have been placed in the subways 10,150 miles of telephone and telegraph wire and 340 miles of wire for electric light service, making in all now in the subways, telephone, telegraph and electric light wires, 23,797 miles. There have been removed during the year 1,361 poles and 18,949,645 feet of overhead wire.

At the present time many of the departments operate separate systems of electric wires, which are largely maintained through separate cables. In several of the large cities of the United States a central electrical exchange, through which intercourse can be had between the different departments of the city government, is in existence, under the control of the local authorities. It is a question for serious consideration whether such a system should not be adopted in this city. If it should be ultimately concluded to adopt such system it could be extended to enable the city to furnish its own electric lights.

Instruments of Precision.

Queen & Company, Philadelphia, have just finished "taking stock" and are congratulating themselves that, in spite of the general dullness in business during the past three months, their sales have been greater than ever before.

The Queen standard resistance boxes, portable testing sets, ammeters and voltmeters, photometers, both portable and stationary, are of such a quality as to demand at least careful consideration, and large orders are received from all parts of the United States, as also for export. In addition to manufacturing a full line of instruments of the regular types, they are continually engaged in designing new apparatus to meet the ever varied wants of the electrical engineer. In this connection should be mentioned the new testing laboratory which Queen & Company have added to their establishment. The room heretofore used for such purposes proving too small for the increasing work, a large isolated department has been built which will contain everything necessary for first-class work. This factory is probably one of the finest in America devoted to the manufacture of scientific instruments. Skilled workmen are employed, and the lathes and other tools are the best and most complete. Close attention is given to the making of apparatus for special work after designs or specifications furnished, or they will design instruments to fulfill special requirements. With Prof. W. A. Anthony as consulting electrician, in addition to the competent corps at their headquarters, they are certainly well prepared to handle their large and increasing business.

ELECTRIC LIGHT NEWS

—— Nicolet, Canada, is talking about being lighted by electricity.

—— A receiver has been appointed for the Peru Glass and Carbon Works of Peru, Ind. The liabilities are placed at $51,000 and the assets at $21,000.

—— Wakefield, Mass., is having an electric light discussion whether the town shall put in a new plant of its own or buy light from a new local company.

—— The Standard Underground Cable Company, Pittsburgh, are out with their year book. It is handsomer and more valuable than ever.

—— The town of Terrebonne, Canada, is lighted by electricity. Messrs. Craig & Son, of Montreal, had the contract; they use a fine water power to run their plant.

—— The board of directors of the Babylon, L. I., Electric Light Company have decided to increase the stock $10,000, adding a new dynamo for incandescent lighting, making a total of $20,000 capital.

—— Superintendent of Streets McGann, has succeeded in bringing into effect a scheme for the lighting of the railroads by electricity along the entire line of their right of way within the Chicago city limits.

—— In two years, the number of electric lights in Boston has been increased from 704 to 1,125, and their cost materially reduced. The number of gas lights has been lessened from 10,104 to 9,281.

—— The Chicago office of the Thomson-Houston Company sold the following isolated plants last week: A. Zeese & Company, 341 Dearborn street, Chicago, special 18,000 candle-power outfit; Schlitz Brewing Company, for the Schlitz Hotel, Milwaukee, Wis., 12 arc light plant.

—— The annual meeting of the stockholders of the Citizens' Electric Illuminating Company, of Brooklyn, N. Y., was held at the office of the company last week. The following were elected as directors for the ensuing year: Thomas F. Nevins, James Shevlin, Anthony Barrett, Hugh McLoughlin and John Delmar.

—— Chief of Police Marsh, of Chicago, is a great believer in plenty of light at night as a preventative of crime. He says that there should be a large electric light in front of each police station to distinguish its location, and that there would be less of the footpad business if electric lights were also placed at each end of all alleys.

—— A story comes from New Castle, Penn., that Joseph Martin, a well-known glass-blower, is engaged in a series of experiments to develop a formula by which glass may be hardened so as to endure great shock. He has devised a method by which a bit of glass was treated and made so hard that a strong blacksmith could not break it on an anvil.

—— The striking thing about Mayor Matthews' inaugural is his recommendation that the city should be allowed to assume "all functions of a public character now commonly intrusted to private enterprise." This means city control of gas, electric light and other enterprises of that character. It is the line which the nationalists desire to have the legislature adopt, and Mr. Matthews is early in the field.—*Boston Record.*

—— The Boston *Advertiser* says: "I understand that the Westinghouse Electric Company is earning a great deal of money, spite of the financial stress through which it has recently passed. The company runs three factories—the Sawyer-Man in New York, the U. S. Electric in New Jersey, and the Westinghouse Electric at Pittsburgh. The net earnings of the Pittsburgh factory alone for the month of November were given to me to-day as $65,000."

On the Alternating Electric Arc between a Ball and Point.

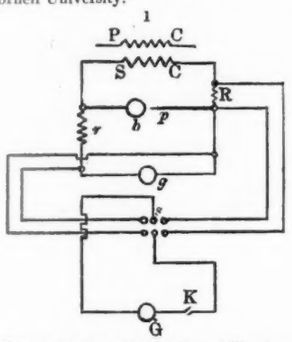
BY EDWARD L. NICHOLS.

PART I.—*From Experiments made by Messrs. W. K. Archbold and G. L. Teeple.*

The phenomenon which forms the subject of this paper was first brought to my notice by Mr. E. G. Acheson, the result of whose unpublished observation, may be briefly stated as follows:

Two wires which formed the terminals of the secondary coil of an alternating current transformer, were brought nearly into contact. One wire was armed with a ball, the other with a point. When the distance was such as to admit of a discharge between the two, it was found that a galvanometer in shunt around the ball and point, indicated a considerable flow of continuous current.

This phenomenon has recently been subjected to investigation by Messrs. Archbold and Teeple. Their experiments, from which in great measure, the data used in the first part of this paper have been taken, are described at length in their Thesis in Electrical Engineering, which is now in the library of Cornell University.*



The apparatus used in the verification of Mr. Acheson's observation, consisted of a Ruhmkorff coil of moderate size, the interrupter and condenser of which had been thrown out of circuit. The primary coil, as in all instruments of that type, consisted of a few turns of heavy wire, surrounding a core of iron wires. When this coil was supplied with current from a small alternating current dynamo, making 14,000 reversals a minute, and the terminals of the secondary coil were brought into position, a discharge of considerable brilliancy took place between them. To the unaided eye, the discharge appeared to be perfectly continuous, but the fact that it was really of an intermittent and periodic character, was indicated by the emission of a well defined musical note, which corresponded in frequency with the period of alternation of the dynamo.

The terminals of the secondary coil were subsequently connected with a brass ball, about one centimetre in diameter, and with a point consisting of a steel sewing needle. These were mounted horizontally in well insulated bearings, the center of the ball in line with the axis of the needle. The distance between the ball and the point of the needle was capable of adjustment by means of a micrometer screw. A mirror galvanometer of 2,000 ohms, having in its outer circuit about 100,000 ohms, was shunted around the ball and point (in parallel circuit with the air space between them). When the induction coil was put into operation, the ball and point being too far apart to admit of a visible discharge, the galvanometer needle remained at zero, but when they were brought within striking distance, a large and constant deflection was produced. When the ball and point were interchanged, the deflection was reversed, its direction always being that which would have resulted from a current flowing from the ball to the point. Under the influence of the discharge, which was intensely luminous, the steel needle was fused at the point and rapidly wasted by oxidation, so that it became necessary to find some more refractory material.† It was finally supplanted by a pointed platinum wire, which, although rendered highly incandescent, withstood the temperature of the arc much better than steel had done.

The following quotation will serve to indicate the conclusions reached by the observers in the course of their preliminary experiments with the platinum point:

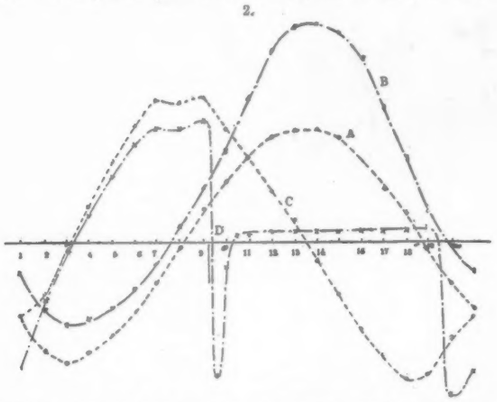
"The behavior of the arc, as its length is increased, is very curious. As the point is withdrawn the arc forms and sings with an even tone, the pitch corresponding to the number of alternations. The point becomes of a dull red color while the galvanometer gives a small but quite steady deflection. As the arc is drawn out it sings louder and more harshly, the point becomes redder, while the galvanometer deflection increases and becomes very unsteady. At a certain critical length the following phenomena suddenly occur: The tone becomes smooth and even, the point brightens almost to a white heat, the intensity depending upon the strength of the current, while the galvanometer deflection becomes much greater and very steady. The explanation suggested, and which subsequent experiments seem to confirm, is as follows: At first the arc forms both ways, the rapid succession giving the tone. As the arc lengthens the arc still forms from ball to point, but is only intermittent (occasional) from point to ball, giving the unsteady tone and deflection. Finally, the distance becomes too great for the arc to form from the point to the ball, while it still passes freely the other way, and the tone and deflection become steady."*

The main portion of the investigation consisted in the determination of the periodic changes of electromotive force and current during a complete cycle, when no arc existed, and of the modifications introduced into the curves of potential and current by the discharge between ball and point. Throughout the entire series of measurements, the striking distance was greater than the critical value already defined, a condition the maintenance of which was secured by watching the indications of the galvanometer.

The instrument used in the measurement of electromotive force was a Thomson mirror galvanometer of 10,000 ohms resistance. The galvanometer line was carried to the dynamo, where by means of an instantaneous contact device, the circuit was closed during an interval of exceedingly short duration, once in every revolution. The device consisted of a wooden disk, mounted upon the shaft of the machine. A single bar of brass, on the periphery of the disk, passed under a brush at every turn. This bar was connected metallically with a brass collar on the shaft, and a second brush, bearing upon the collar, completed the circuit. By thus closing the line through the galvanometer, for an instant, once in a revolution, the electromotive force of the secondary circuit, at that particular point of the cycle for which the contacts were made, could be measured; and since the brush was adjustable through considerable range, the entire cycle could be explored.

The arrangement of the entire apparatus is shown in Fig. 1. PC and SC are the primary and secondary coils of the inductorium, *p* and *b*, respectively, the point and ball. R is a non-inductive resistance, *g* the indicating galvanometer, in parallel with the ball and point, *r* a non-inductive resistance, *s* a switch by means of which the Thomson galvanometer could be shunted at will around R or *g*. K is the instantaneous contact device, and G is the Thomson galvanometer. When the Thomson galvanometer was shunted around R, which was placed in the main circuit leading from the induction coil, it served to indicate the current flowing in that circuit during that portion of the cycle for which contact was being made; when connected in shunt with the galvanometer *g*, it measured the fall of potential through the coils of the latter instrument. The function of the indicating galvanometer, during this part of the investigation, consisted in showing, by the size and direction of its deflection, whether the discharge between the ball and point continued to maintain its proper character.

The result of measurements throughout a complete cycle, both when the arc was formed and when it was extinguished, is shown in curves B and A (Fig. 2). Curve A is with close approximation a curve of sines, and it indicates the usual fluctuations of current to be looked for in the secondary circuit of an alternating system. Curve B shows the current throughout the cycle when the arc was playing. Abscissæ represent portions of a complete cycle, the period being divided into 20 equal parts, ordinates the relative amounts of current through the resistance R, or the total current in the secondary circuit. Deflections, when the current flows from ball to point, are plotted above the base line. As may be seen from the curve B, the current flowing in the positive direction during each cycle was greatly in excess of that flowing in the negative direction, when the discharge was taking place between ball and point, whereas when no arc was formed, (curve A) the areas enclosed by the positive and negative branches of the curve were equal. Now, there were two paths offered to the current, that through the galvanometer *g* and the resistance *r*, which consisted of a column of copper-sulphate solution between copper poles (approximately 112,000 ohms) on the one hand, and



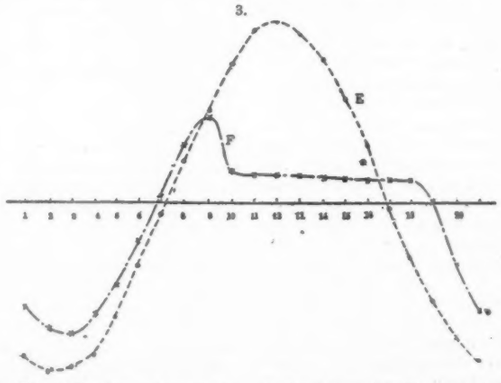
the parallel circuit between the ball and point on the other. The resistance of the latter path was infinite whenever the arc was interrupted, falling to finite values during each discharge. Increase of current through R indicates, therefore, the formation of the arc. Such increase is found to exist during the second half of each cycle, that is to say, during that interval in which the ball is positive; and it might be inferred from these curves alone that the discharge was an intermittent one taking place always from ball to point. Other curves, taken simultaneously with A and B, the Thomson galvanometer being shunted around the indicator galvanometer, lead to the same conclusion. The curves marked C and D (Fig. 2) show the results obtained. It was thought that they would give the fluctuations in electromotive force between ball and point, corresponding in time to the current fluctuations in the resistance R. The indicating galvanometer, however, owing to the very rapid alternations to which the circuit was subjected, was found to possess such high self-induction as to materially influence the result. Strictly speaking, the curves C and D, therefore, give the periodic changes of electromotive force at the terminals of the indicator and not those occurring at the ball and point.

These curves are nevertheless of considerable interest. The curve C shows the character of the cycle when no arc was formed, and D, when the arc was in operation; C, like A, is approximately a curve of sines. The irregularity at its positive crest, which also appears in D, is probably due to the imperfect performance of the contact brush, and having no bearing upon the phenomena which the curves are intended to elucidate, may be disregarded. Since no current was passing between the ball and point when A and C were taken, they represent the fluctuations in successive portions of the same circuit. The lag, due to self-induction, however, is very marked, amounting to almost 90 degrees of phase. Curve D, which shows the influence of the arc, is especially instructive. The potential rises during the first part of the cycle (ball positive); then follows a very sharp oscillation, occupying about one-twentieth of the entire period or $\frac{1}{1400}$ of a second of time. The potential then reaches a small positive value which it maintains without fluctuation for at least four-tenths of a complete cycle, when it suddenly becomes strongly negative.

To obtain curves of electromotive force between ball and point directly, a non-inductive resistance was substituted for the indicating galvanometer and the measurements from which curves C and D had been drawn were repeated. Of the two curves thus determined, the one taken when the arc was not playing (E, Fig. 3) is a sine curve closely coinciding in phase with the simultaneous curve of current (A, Fig. 2). The corresponding curve F, which was taken while the discharge was passing between the ball and point, is in its essential features of same character as curve D (Fig. 2). The interval of uniform positive potential is of the same length and it is coincident with the interval of excess of current which shows itself in the positive branch of curve B. It is noteworthy that this interval of uniform potential, which marks the duration of the arc, occupies in both cases the same portion of the cycle (between scale-divisions 10 and 19, approximately), although there is otherwise a difference of phase, due to self-induction, amounting to at least four scale-divisions. Curve C for instance, reaches its maximum in the neighborhood of scale-division 8, curve E at scale-division 12. The exclusion of the coils of the indicating galvanometer from the circuit, reduced this difference of phase to a small quantity, and it suppressed altogether the remarkable oscillation of electromotive force (see curve D) which in all preceding experiments had introduced the formation of the arc.

The results exhibited graphically in these six curves, afford abundant verification of the theory of the ball and point phenomenon, given in a previous paragraph; and they establish the fact that in the secondary circuit of a transformer, such as that made use of in these experiments, the striking distance from ball to point exceeds that from point to ball. It follows that whenever the space between the ball and point is less than the former and greater than the latter distance, discharge will occur only during that portion of each alternation for which the ball is positive, and that under such circumstances, a galvanometer placed in the circuit will show a constant deflection.

Complete corroboration of the foregoing conclusion was obtained by studying the image of the arc in a revolving mirror. With a discharge of less than the critical length, the discharge was seen to consist of two distinct sets of sparks, all of the same duration but differing in color. Each alternate discharge was purple, the intermediate ones being of a greenish cast. The spark images were everywhere equi-distant and their duration was about four times as great as the intervening intervals of darkness. The extension of the sparking distance beyond the critical point, resulted in the complete suppression of the series of purple images, the intermediate ones remaining undisturbed in position, duration and appearance. The intervals of darkness were then estimated to occupy six-tenths of each cycle, the discharges, four-tenths; a ratio which corresponds with that of the duration of positive potential of the ball (as shown in curve) to the total length of a complete cycle.



The ball and point phenomenon is unquestionably very closely related to a class of effects with which students of static electricity have long been acquainted. One recalls, to begin with, Faraday's experiments with the Leyden jar; in which, of two paths, the spark invariably followed that involving passage from a positive ball to a negative point, in preference to another, through equal air-space, between a negative ball and a positive point.* Wiedemann and Rühlmann have since shown

* The effect of placing a Ball and Point in a High Potential Alternating Current Circuit, by W. K. Archbold and G. L Teeple. Thesis in MS., Cornell University Library; 1889.

† The attempt to use carbon terminals, led to the following observation. "A carbon pencil substituted for the point, gave the same effect, but upon putting the carbon in place of the ball, it still acted as a 'point.' If two carbons were used the more pointed one acted as a 'point.' It was observed that the end of the needle was fused into a ball by the heat of the arc, and would then act as a 'ball' to the smaller particles of carbon projecting from the end of the pencil. Two brass balls brought together, caused a drifting of the galvanometer needle from one side to the other, according, it is to be presumed, as the discharge changed the nature of the two surfaces, so that minute points formed on one or the other." (Archbold and Teeple; Thesis, p. 3.)

* Archbold and Teeple; Thesis, p. 5.

*Faraday: Experimental Researches, §1493.

that between spherical electrodes which differ in diameter, the quantity of electricity necessary to produce a discharge is less when the larger ball is positive than when it is of negative charge,* and Macfarlane has measured the electromotive force which will produce a spark between a point and plate, and has found it to be greater when the point is positive than when it is negative.†

In view of the experiments described in the present paper, it appears that what is true, in this particular, of the spark from the Leyden jar and the discharge of the Holtz machine, is true also of the alternating current arc.

PART II.—*From experiments made by Mr. F. C. Caldwell.*

After the completion of the experiments of Messrs. Archbold and Teeple, the study of the ball and point phenomenon was taken up under the writer's direction by Mr. F. C. Caldwell; the chief purpose of the investigation being to test the applicability of the effect to alternate current measurement.‡

Irregularities of action due to rapid changes in the surfaces of the point and ball, by corrosion and disintegration under the arc, finally caused the attempt to be abandoned, for the time being, but Mr. Caldwell, in the course of his work, made a large number of observations of the discharge under various conditions. Many of these are of interest in this connection on account of the light which they throw upon the original experiments, and because of the lines of further research which they suggest.

Mr. Caldwell's first step, after having repeated the preliminary experiments of Archbold and Teeple, and verified their statements, was to substitute a ball with a surface of platinum for the brass ball used by them. The new ball withstood the action of the arc no better than the old one had done. It soon became covered with a black deposit, the growth of which modified and vitiated the action of the apparatus. In experimenting with such a ball, the surface of which was still bright and new, and with a point of the same metal, it was noticed that within the critical distance, while the spark was passing in both directions, there appeared to be two distinct paths along which the discharge was taking place. One of these was nearly in the line from the point to the ball, normal to the surface of the latter, the other from the point in a direction approximately at 45 degrees with the common axis of the pointed rod and ball. Upon increasing the distance until the discharge entered the "one way" stage, the longer and oblique path of flow vanished. In the revolving mirror the two classes of sparks were easily identified. They were found to occur in alternation with each other, the spark which followed the normal path being that which passed from ball to point, the other that from point to ball. The images of the discharge from the point disappeared as soon as the critical distance was reached. In order to place the matter beyond all doubt, the times of the discharge which followed the normal path were determined by an ingenious method, quite independent of that used by the first observers, and it was found that the spark occurred always in that part of the cycle during which the ball was positive.

Mr. Caldwell's method of fixing the time of the discharge, briefly stated, was as follows: An adjustable contact device, similar to that used by Archbold and Teeple, was attached to the shaft of the dynamo. A wire from one pole of a large Holtz machine, driven by power, was carried to the neighborhood of the ball and point, where two platinum terminals, 1 mm. apart were set up. The wire was connected with one of these and a line was carried from the other to the contact device. A wire from the latter to the remaining terminal of the Holtz machine completed the circuit. Whenever the brush made contact, a spark leaped between the platinum terminals just described. By adjustment of the brush, the spark could be made to appear at any desired instant in the cycle of alternations of the dynamo. The platinum terminals were placed so that the image of the spark in the revolving mirror was seen side by side with that of the discharge between the ball and point, and the precise position in the cycle, occupied by the latter, was thus readily determined.

Closer study of the two paths of discharge showed that the oblique arc left the very apex of the point, swinging out laterally into its path; also that the normal arc on approaching the point avoided the apex and entered the wire from the side, never passing in at the point itself.

From these observations it appears:

1. That the discharge from the ball (positive) leaves the latter in a direction normal to the surface, but that it enters the other terminal at some distance from the apex.

2 That the discharge from the point (positive) leaves the very apex of the latter, but is deflected into a course nearly 45 degrees from the axis, and reaches the ball obliquely at some point on its side.

Taking these observations into consideration, the explanation of the cessation of the discharge from the point at the critical distance and of the establishment of the "one way" arc, follows at once. The two paths of discharge differ in length and for a given electromotive force, the maximum striking distance is sooner reached in the case of the oblique than of the normal arc, so that the latter continues to pass at greater distances (of ball and point) than the former.

Further inspection of the images of the two arcs in the revolving mirror revealed another curious fact. The mirror was set up with its axis of revolution parallel to the common axis of the ball and point. The image of an instantaneous spark following the line of the normal arc would, therefore, be a line parallel to the axis of the mirror. Since the duration of the discharge was nearly .001 seconds, this linear image was expanded into a broad rectangular band. The image of any oblique discharge would in general be an oblique parallelogram. The image of the discharge from point to ball, however, was not of that form. It appeared rather as a warped surface, the form of which could be explained only by supposing that the discharge at first followed the normal path to the ball, and was gradually displaced as the cycle progressed, until it reached its extreme position at 45 degrees to the axis, just before the rupture of the arc.

Definite results were obtained only while the platinum surface was new and bright. The region where the normal arc left the ball soon became tarnished and corroded and there was an increasing tendency on the part of the oblique arc to leave its own path and join the other.

When the ball was supplanted by a platinum wire, 1 mm. in diameter, with rounded tip, the object being to force the two discharges into a common path, it was found that the arc from the point (positive) avoided the end of the wire altogether, and struck in upon the cylindrical surface beyond. When the end of this wire was surrounded by an insulated platinum ring which was connected with the terminal of the induction coil by a separate wire—the intention being, if possible, to separate the two phases of current and conduct them over different wires—it was found that the arc from the point (positive) always entered the central wire, never being diverted to the ring, although the intervening air-space was less than a millimetre. The returning arc, however, would sometimes leave the ring and sometimes the wire, and a galvanometer placed in the circuit between the ring and the induction coils, showed a large deflection, such as would be caused by a flow of current towards the ring. This result seems to be in accordance with the conclusion reached from the inspection of the images in the revolving mirror; namely, that the arc from the point always formed first along the shortest path. Deflection from that path in the case of the wire and ring would probably be hindered by the insulating medium which intervened. When, finally, a cluster of points were opposed to the single point, it was found that the discharge from the latter was always along a single path, whereas the return arc from cluster (positive) often followed several paths.

It had been noted by Messrs. Archbold and Teeple, that the platinum point used in their experiments, which was red hot while the arc was passing in both directions, became white hot during the "one way" stage. The heating effects at the surface of the brass ball were not discernible, but when Mr. Caldwell substituted a thin sheet of platinum for the ball, this became incandescent under the action of the arcs. The spot where the oblique arc (point positive) impinged upon the foil became white hot, while that at which the normal arc (ball positive) left the foil was barely red hot. In this respect then, the discharges act like the ordinary sparks of the influence machine or induction coil, which, as has been shown by Despretz, Poggendorf, Naccari and other observers, heat the negative electrode to a higher degree than the positive one. This action is in marked contradistinction to that of the continuous current arc, the positive terminal of which takes the higher temperature.

In this brief account of Mr. Caldwell's experiments, I have omitted to mention many of the observations recorded by him. He had occasion, in the course of his investigation, to study the discharge under a variety of conditions and found that when liquid surfaces (mercury or water) were used in place of the ball; also, that when hydrogen, carbon-oxide or illuminating gas were substituted for air, as a dielectric, the ball and point effect, more or less modified, could still be obtained. The investigation of these points, although it has already led to some results of significance, is as yet very incomplete.

*Weidemann and Rühlmann: Annalen der Physik und Chemie, cxiv. See also Weidemann: Elektricität, iv, p. 462.

†Alexander Macfarlane: Proceedings of the Royal Society of Edinburgh, vol. x, p. 555. 1879-80.

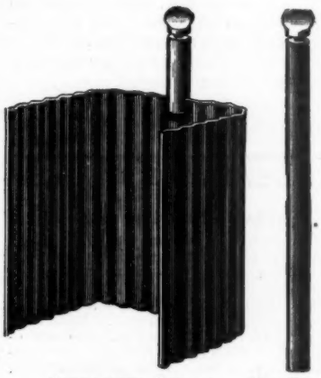
‡Frank Cary Caldwell: A study of the Alternating Arc between a Ball and Point. Thesis in MS. Library of Cornell University, 1890.

The Hirlimann Primary Battery.

We illustrate a new primary battery of sal-ammoniac base, put out by Mr. C. J. Hirlimann, of 91 Green street, this city.

Mr. Hirlimann's long experience and successful career in the invention and manufacture of improved forms of primary batteries of this class is such that his name alone is quite sufficient to justify careful examination into his claim for the new type of cell, which is to be commercially known as the "Champion" Battery.

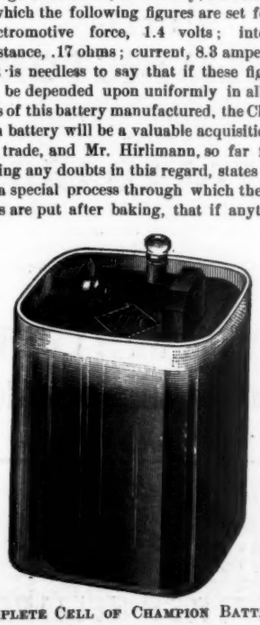
The battery is made up in two distinct patterns, the difference, however, lying only in the form of the zinc, and it will be seen by referring to the illustrations that one of the zincs consists of the ordinary rod Leclanche zinc, while the other is a large surface corrugated sheet zinc. When the rod zinc is employed the battery is most suitable for telephone work and where a constant output of energy is required, while



CORRUGATED ZINC OF CHAMPION BATTERY. ROD ZINC OF CHAMPION BATTERY.

the corrugated zinc is used where large quantities of current for a short time is the desideratum, as in gas lighting work, electric bell ringing, etc. In further support of the merits of the battery an official measurement of the cell by the distinguished electrician, George d'Infreville, of this city, is submitted in which the following figures are set forth: Electromotive force, 1.4 volts; internal resistance, .17 ohms; current, 8.3 amperes.

It is needless to say that if these figures can be depended upon uniformly in all the cells of this battery manufactured, the Champion battery will be a valuable acquisition to the trade, and Mr. Hirlimann, so far from having any doubts in this regard, states that by a special process through which the carbons are put after baking, that if anything



COMPLETE CELL OF CHAMPION BATTERY.

there will be an increase in the amperage of his cell beyond the official report above given.

The carbon reservoir is quadrangular in shape and charged with ingredients under a secret formula, and is provided with a neat top, fitting closely into the glass jar, to prevent evaporation and facilitate sealing.

The Champion battery, both with rod zinc and with corrugated zinc, will be on sale at all prominent supply houses in this country, and patents in Europe we understand are applied for.

ELECTRIC CLUBS.

New York Electric Club.

A San Francisco *Call* reporter writes that he "happened against" Mr. John I. Sabin. The fate of the reporter still remains a mystery.

Col. Henry C. Davis sailed for Europe last week.

Mr. F. L. Pope will deliver a lecture on "The Electric Railway, Historical, Statistical and Technical," at the next meeting of the Club, January 22d.

Out-of-town visitors during the last week were as follows: H. C. de Wolfe, Portland, Ore.; S. Beals, Orange, N. J.; C. J. Roberts, Chicago; S. D. Nesmith, Cleveland; J. O. Ellison, Chicago; E. F. Spaulding, Bridgeport, Conn.; W. J. Emanuel, Denver; W. C. Fish and H. B. Cram, Boston; Lincoln Welles, Wyalusing, Pa.; F. P. Fish, Boston; J. N. Culbertson, Buffalo; F. E. Pettingell, Boston; P. B. Shaw, Williamsport, Pa.; S. F. Adams, Goshen, Va.; S. C. Bowen, Boise City, Idaho.

American Institute of Electrical Engineers.

The Fifty-third Meeting of the Institute will be held January 20th, at the rooms of the Institute, 12 West 31st street. The discussion of Mr. Kennelly's paper, "Inductance and Its Proposed Unit, the Henry," postponed from the last meeting, will be opened by Dr. Cary T. Hutchinson.

Reports of the following committees will be presented for action: The Standard Wiring Committee; Committee on the Value of the "Henry"; Committee on Amendment of the Patent Law.

Non-resident members who are interested in the above subjects are invited to contribute their views in writing.

Boston Electric Club.

The Inaugural Dinner for 1891 will be given at Young's Hotel, Friday evening of this week, at 7 o'clock. It is intended that the occasion shall be of special social interest to members and complimentary to the retiring and new administrations.

The House and Entertainment Committee, for 1891: Messrs. Wm. D. Warner, C. W. Holtzer and Chas. B. Burleigh. Mr. Warner was chosen chairman and Mr. Burleigh the secretary of the committee.

Mr. Geo. M. Phelps, New York, was among the guests of the Club this week.

Mr. "Burt" Brooks, of the American Circular Loom Company, this city, is the champion pool player of the Club. The rivals for the billiard championship are Messrs. Billings and DeBauset.

The Quarterly Meeting, on January 5th, passed off pleasantly, with the new president, Capt. Eugene Griffin, in the chair. Secretary Ross read an appropriate and highly complimentary eulogy in behalf of the retiring president, Mr. Henry B. Cram, which was listened to with interest and greeted with applause.

CARBON RESERVOIR OF CHAMPION BATTERY.

Massachusetts Institute of Technology Electric Club.

The M. I. T. Electric Club, to the number of 22, dined at Young's Hotel, Boston, the evening of January 2d. The guests were Professor C. R. Cross, H. E. Clifford and W. L. Puffer. F. T. Snyder presided.

California Electrical Society.

W. C. Quimby read a paper on "Primary Batteries," before the Society at its rooms in San Francisco, January 5th.

KINDRED INTERESTS

The Leclanche Battery Company have removed to 109 and 111 East 131st street, New York City.

The National Pipe Bending Company, of New Haven, Conn., have opened branch offices at 15 Cortlandt street, New York, where Mr. J. J. Nef is in charge, and 8 Oliver street, Boston, in charge of Mr. J. P. Lennox.

Mr. George Cutter, who has been in the East for the past three weeks completing business arrangements, has returned to Chicago. He is now fitting up his shop for making the many electric appliances which he controls; hence, these may be expected on the market very soon.

The Hanson & Van Winkle Company is the name of the new corporation which, on January 1st, succeeded to the business of Hanson, Van Winkle & Company, Newark, dealers in chemicals and electroplaters' specialties. This is one of the old houses in the business, the original firm having been established in 1820.

Alexander, Barney & Chapin, 20 Cortlandt street, New York, have been compelled, through large business, to organize a special department for the sale of alexite and fibrone. Mr. Henry Alexander is in charge of the new department. Messrs. W. C. Fish and Henry B. Cram, of the Bernstein Electric Company, Boston, spent several days in New York, last week, making extensive business arrangements with Alexander, Barney & Chapin.

A 20 horse-power Perret multipolar low speed motor has just been placed in the Hamilton Club building, Brooklyn, to operate the pump of a hydraulic elevator, superseding a motor of another make. The Elektron Manufacturing Company is now filling orders for motors from four different elevator builders. These low speed machines are rapidly coming into favor for the operation of elevators, some being connected direct to the screw shaft of passenger elevators and some being belted to power elevators in the ordinary manner. They are giving great satisfaction under all these methods. The Perret motors are now equipped, unless otherwise ordered, with self-oiling bearings, and with self-feeding carbon brushes, which require practically no attention or adjustment, thus avoiding all the difficulties with brushes sometimes experienced by those unfamilar with motors.

Change of Trade-Mark. The following circular is being distributed by the New York Belting & Packing Company, 15 Park Row, New York City, the greatest representatives of the rubber industry in the United States, if not in the world. They say:

"We have found it necessary to change the trade mark of our Diamond grade of goods, and hereafter will use the following, which we have secured, and; after the disposal of goods bearing the old trade-mark, all *genuine* 'Diamond' grade of goods will bear the DOUBLE DIAMOND BRAND.

N.Y. BELTING & PACKING CO. TRADE DIAMOND MARK N.Y. BELTING & PACKING CO. NEW YORK

New Trade-Mark.

"Our goods have been giving such great satisfaction that some manufacturers of rubber goods have found it profitable to use a Diamond brand in order to palm off an inferior quality. Our 'Fine,' 'Para' and 'Carbon' brands will not be changed, as they are also secured. Hoping to be favored with your further orders, yours very truly, New York Belting & Packing Company, per John H. Cheever, Treas."

THE PAISTE CALENDAR FOR

1891

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ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON DECEMBER 30, 1890.

443,823 Apparatus for laying electric conductors.
443,824 Apparatus for laying conductors in conduits; Thos. J. Cope, Philadelphia, Pa.
443,834 Electrical annunciator; John W. Luthe and Alfred E. Jeavous, Cleveland, O., said Jeavous assignor of one-half to said Luthe.
443,944 Attachment for electric arc lamps; James A. Manning, Ashtabula, O.
443,976 Galvanic battery; Geo. A. Smith, Halifax, Canada.
443,980 Electric motor; Chas. J. Van Depoele, Lynn, Mass.

ISSUED JANUARY 6, 1891.

443,992 Manhole for underground electric conduits; William H. Hart, Brooklyn, N. Y.
444,005 444,006 Tightening device for suspended electric conductors; David Mason, New York, N. Y.
444,067 Dynamo electric machine; Alfred G. Holcombe, Long Island City, assignor of one-half to Chas. L. Browne, New York, N. Y.
444,104 Electric arc lamp; Albert W. Reppy, Oaklank Pier, Cal.
444,108 Signaling apparatus; Isaiah H. Farnham, Wellesley, assignor to the New England Telephone and Telegraph Co., Boston, Mass.
444,110 Brake for electric cars; Bellville L. Randall, Boston, Mass.
444,144 Signal box; John C. Wilson, Boston, Mass., assignor to the Municipal Signal Co., Portland, Me.
444,154 Electric arc lamp; Joseph J. Skinner, Boston, Mass.
444,169 Electric motor attachment for reed organs; Levi K. Fuller, Brattleboro, Vt., assignor to the Estey Organ Co., same place.
444,181 Radial car truck. 444,182 Car spring check. 444,183 Swing bolster check for car trucks; Wm. Robinson, Boston, Mass., assignor to the Robinson Radial Car Truck Co., Portland, Me.
444,188 Electric motor; Chas. J. Van Depoele, Lynn, Mass.
444,217 Electrical range finder; Bradley A. Fiske, U. S. Navy.
444,223 Magnetic ore separator; Clarence Q. Payne, Stamford, Conn.
444,245 Electric annunciator; August Hornell, New York, N. Y.
444,265 Electric agricultural system; Edward M. Bentley, New York, N. Y.
444,273 Swinging or drop arm for electric lamps; Edw. Cliff, Castleton, N. Y.
444,311 Anti-friction bearing; Phineas Arnold, Canal Dover, O.
444,317 Electric wire insulating cleat; John S. Potter, Newton, and David J. Cartwright, Boston, Mass.; said Cartwright assignor to said Potter.
444,330 Support for electric lamps; James Chase, Rochester, N. Y.
444,358 Registering mechanism or counter actuated by electric currents; Robt. Jewell, London, England.
444,374 Electric switch; Chas. E. Wilson, Chicago, Ill.
444,377 Molding for electric wiring; Geo. Cutter, Chicago, Ill.
444,392 Electrode for secondary batteries; Stanley C. C. Currie, Philadelphia, Pa., assignor to the United Gas Improvement Co., same place.
444,397 Current-collecting device for electric railways; Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Co., of Connecticut.
444,406 Range finding and lighting apparatus; Harry Anderson, 25 New Road, Woolwich, County of Kent, and John A. Norton, 49 Curtain Road, County of Middlesex, England, assignors of one-half to Edw. W. Creecy, Washington, D. C.

THE PATENT FOR THE UNITED STATES

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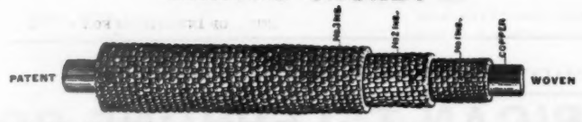

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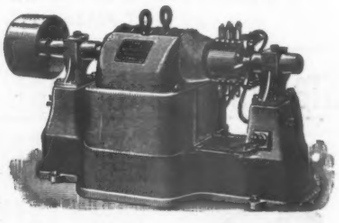

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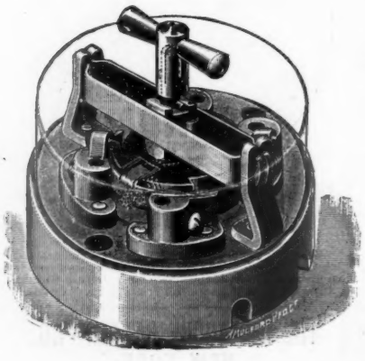

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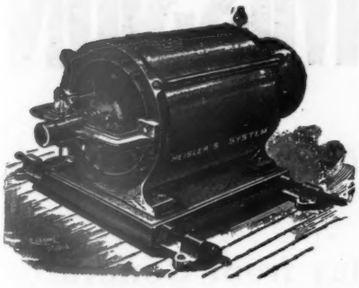

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CC	.....	10	.....	.....	6.3	1½		530
CCC	.....	.....	.....	25	8.0	2		530
D	16	.....	.....	.....	12.0	2½		780
DD	.....	20	.....	.....	12.5	2½		780
DDD	.....	.....	26	.....	13.0	2½		780
E	20	.....	.....	.....	15.0	3		990
EE	.....	25	.....	.....	15.6	3		990
EEE	.....	.....	32	.....	15.0	3		990
G	.....	.....	.....	50	16.0	3		990
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G	.....	35	.....	.....	21.0	4		1,360
GG	.....	.....	45	.....	21.0	4		1,360
GGG	.....	.....	.....	70	21.0	4½		1,360
H	40	.....	.....	.....	29.7	6		1,750
HH	.....	50	.....	.....	30.0	6		1,750
HHH	.....	.....	64	.....	29.5	6		1,750
I	52	.....	.....	.....	38.0	8		2,290
II	.....	65	.....	.....	38.6	8		2,250
III	.....	.....	83	.....	38.0	8		2,290
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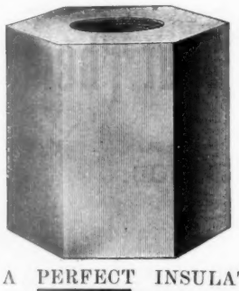

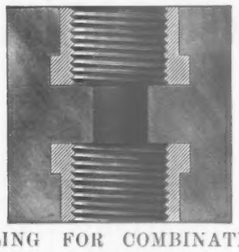

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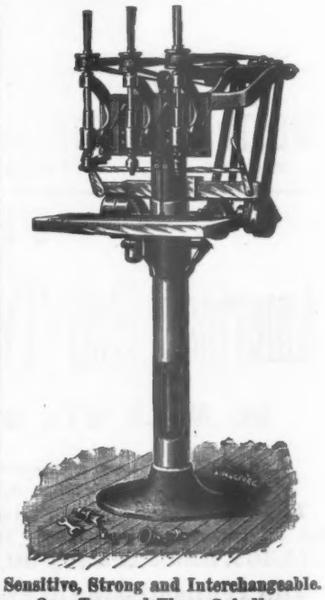

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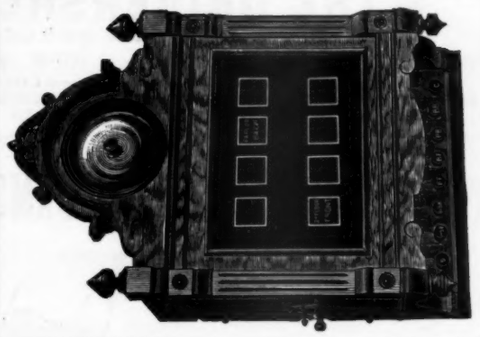

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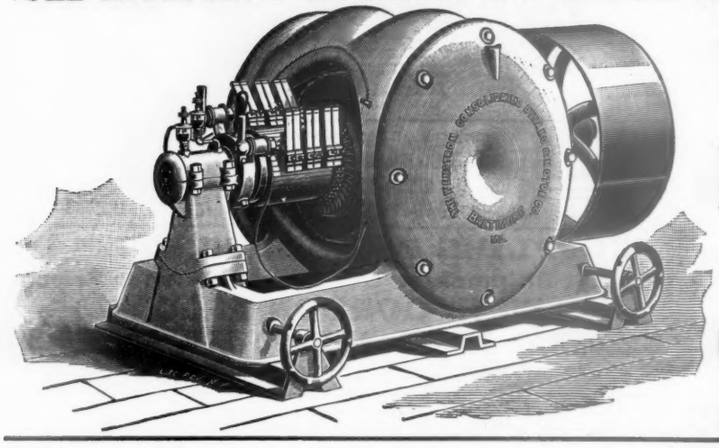

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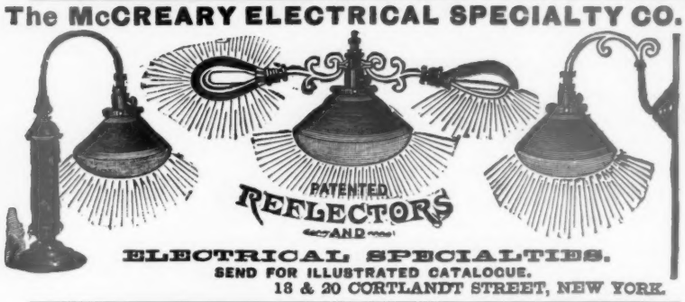

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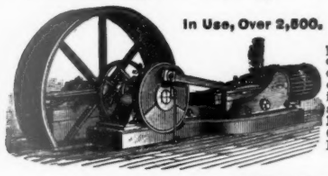

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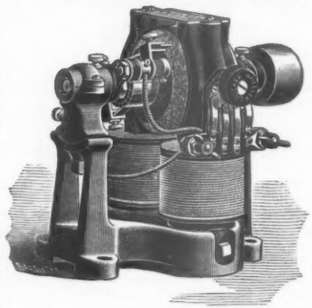

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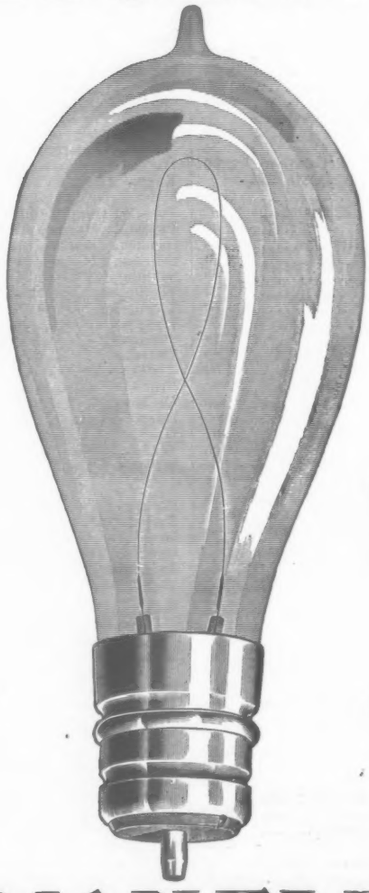

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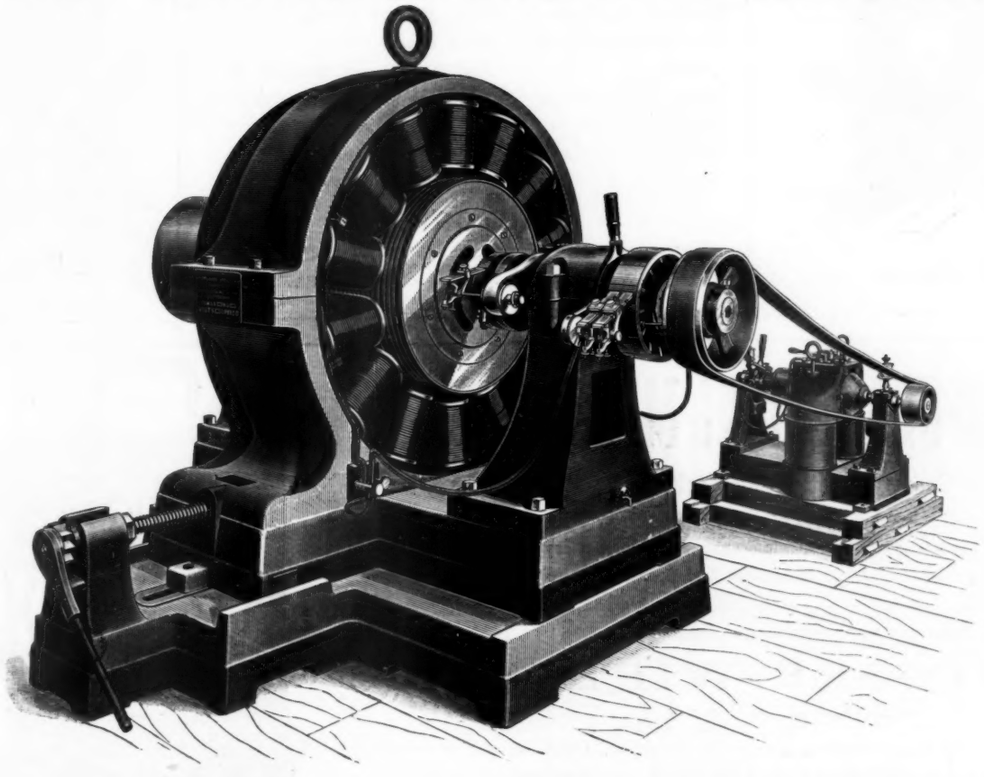

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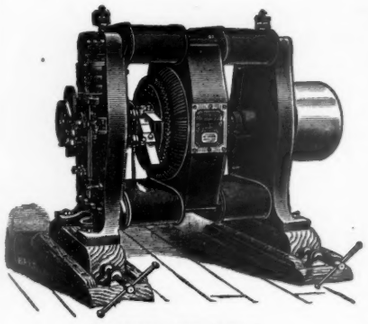

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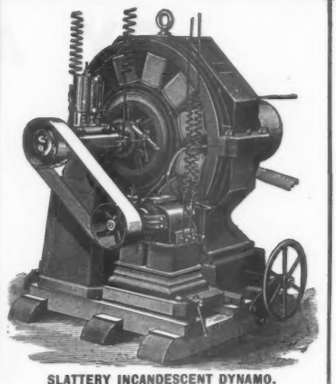

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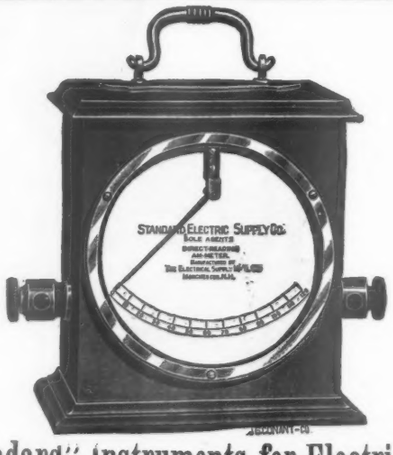

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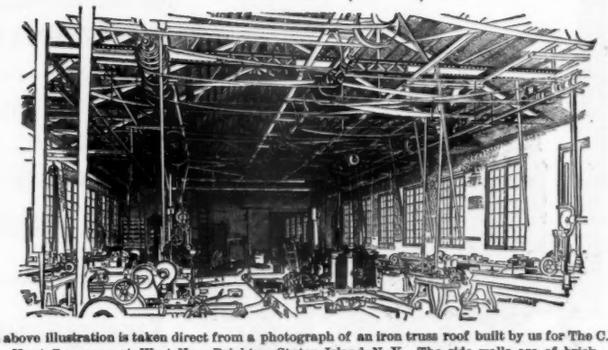

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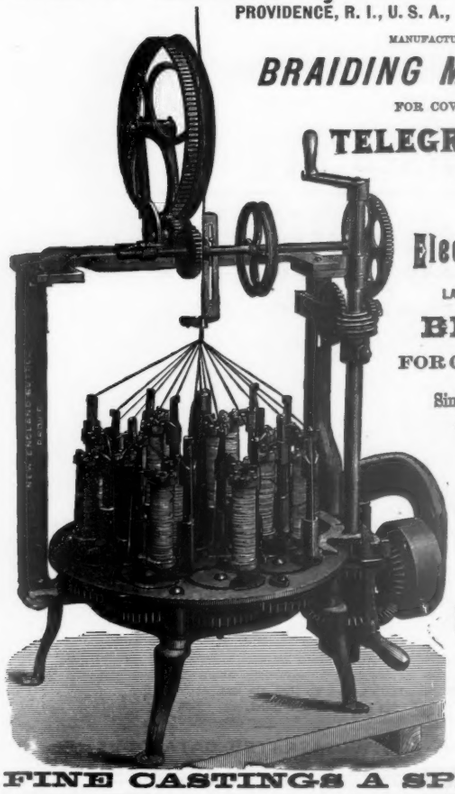

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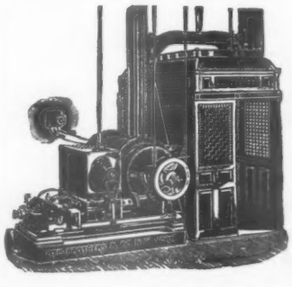

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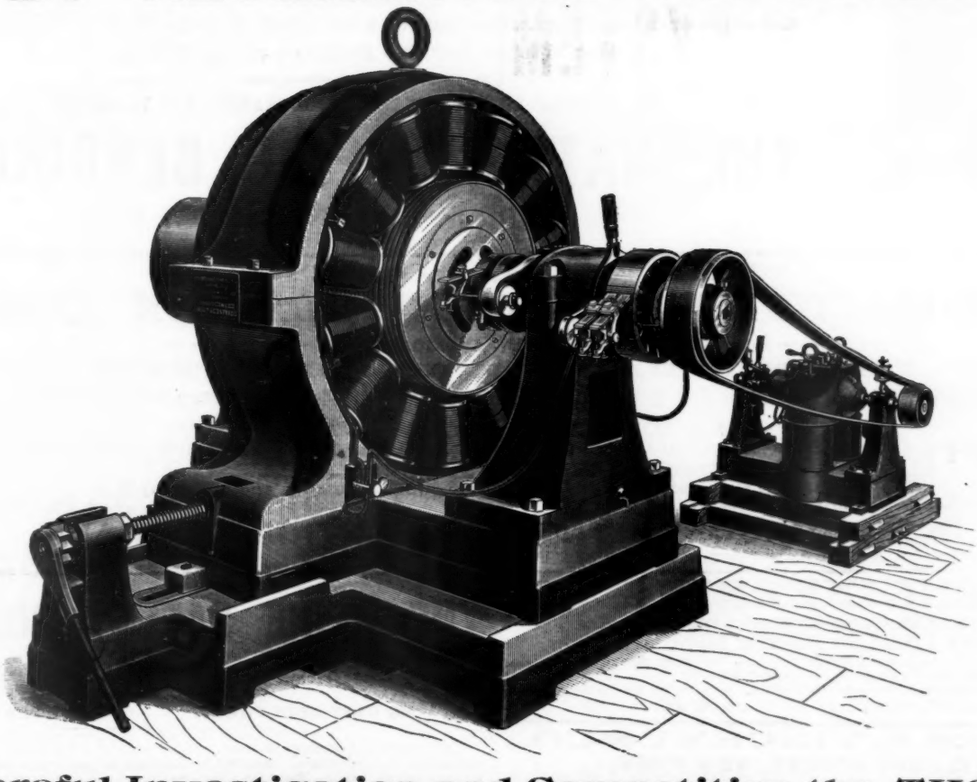

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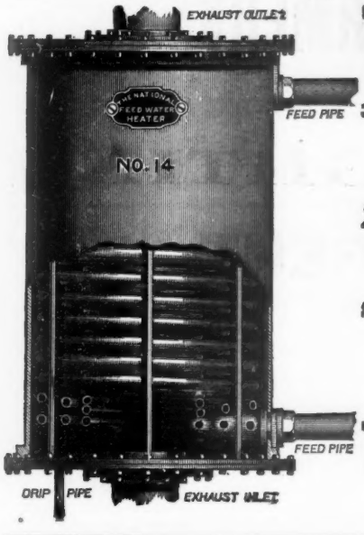

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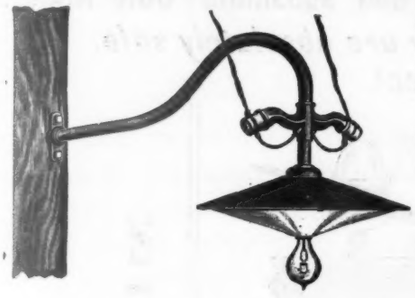

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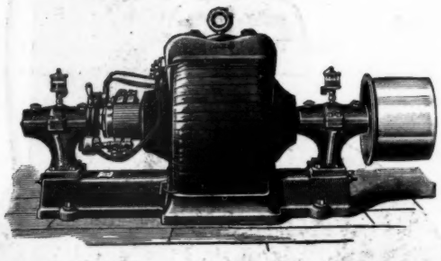

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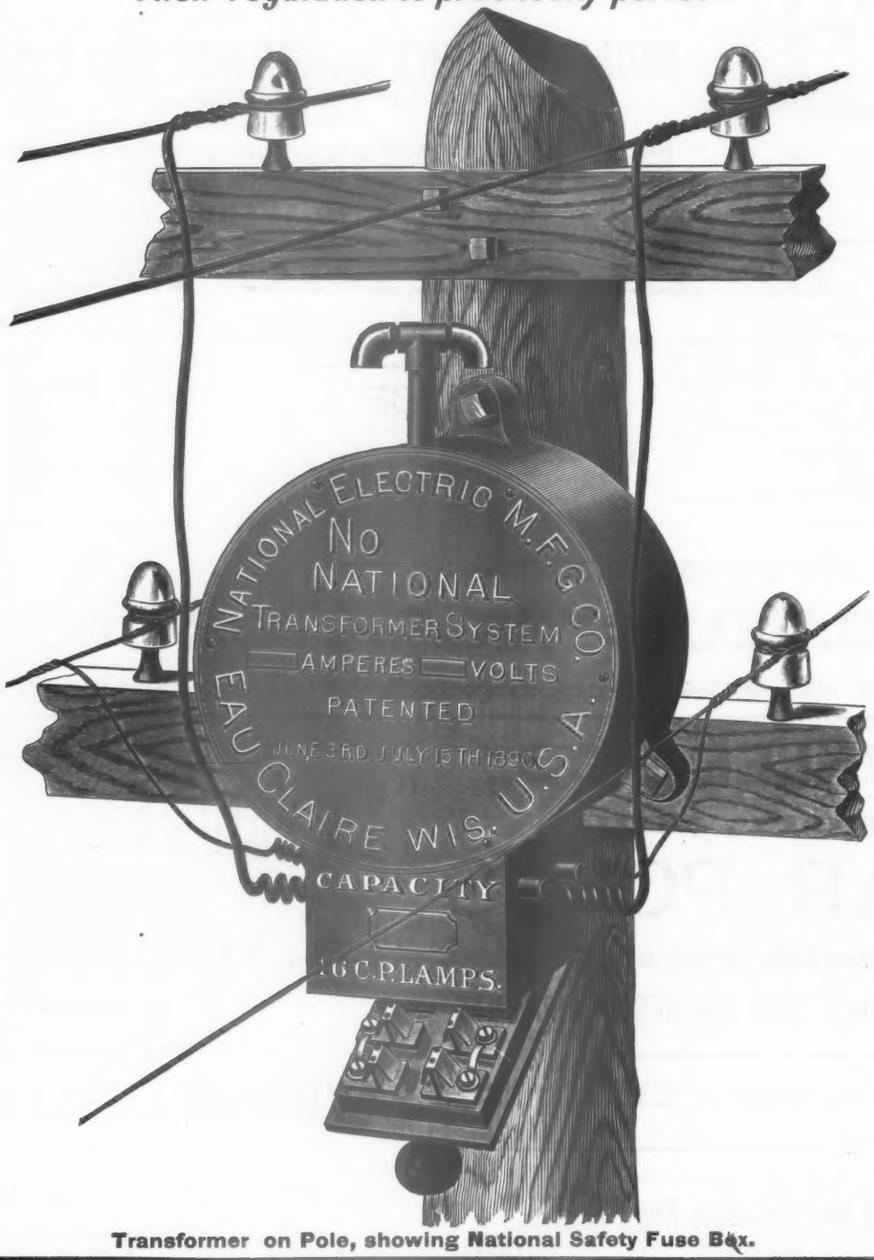

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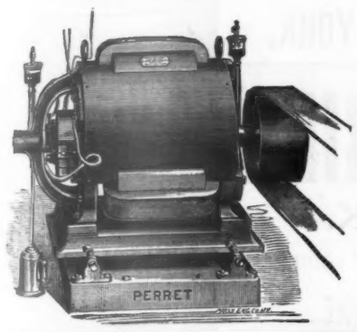

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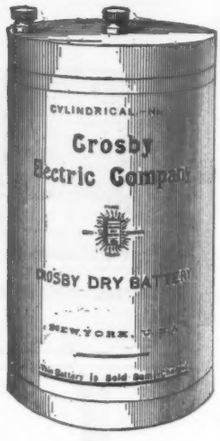

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